The Electrical Review

VOL. CVIII. MARCH 6, 1931. No. 2780.

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY, Price 6d.

THE ELECTRICAL REVIEW, 4, LUDGATE HILL, LONDON, E.C.4.

Telegraphic Address: "AGEEKAY, CENT, LONDON." Code, A B C. Telephone No.: Central 5871 (5 lines).

The "Electrical Review" is the recognised medium of the Electrical Trades and has by far the largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom £1 14s. 8d.; Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to E.R. (1930) LTD., and crossed "Lloyds Bank, Law Courts Branch."

For List of Foreign Agents for the ELECTRICAL REVIEW see Advertisement Supplement.

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Power for Industry.

THE tenth annual report of the Electricity Commissioners (reviewed in this issue) records an increase in kWh sold of upwards of 11 per cent. for the twelve months ended March 31st last, notwithstanding the unsettled conditions of trade. Figures for the year ended December 31st last, however, show that the rate of increase is now only about half that figure, and give practical point to what has been implicit in the recent public utterances of men prominent in our own industry, that we cannot afford—whether in our own interests or on broader grounds—to stand aloof from the common stress.

Although the amount of electricity sold during the past nine months has actually increased, it is known that the average overall figure is the resultant of very diverse conditions. While in the South-East of England the increase, due mainly to the domestic load, has been as much as 16 per cent., in the manufacturing districts there has in many cases been a serious positive decline, which really active development of the domestic load has been quite unable to stem, though it has helped to mitigate its consequences. The power load is still by far the most important load; it accounts for nearly two-thirds of the total kWh sold, compared with a little over one quarter for lighting and domestic purposes. It holds first place, however, on other grounds than its large demands for electricity; it helps to provide the spending power of the workers that enables them to pay for electricity and electrical appliances for their own homes. Whereas electricity for domestic purposes is necessary for a good existence, electricity for motive power is necessary for existence itself.

While advocating a strenuous campaign in favour of domestic and rural electrification, we do desire to urge that, especially having regard to the present state of trade, electrical engineers should not overlook the more immediately urgent need to encourage the use of electric motors in industry. Industrialists are being compelled now to reconsider their methods of production, and this in itself provides an opportunity for electricity not only to supersede other forms of power (we are only two-thirds electrified) but also to explore every avenue for increasing the total horse power per worker. The most obvious way in which supply undertakings can help lies in low prices for electricity. The cost of power is not usually a large proportion of production expenses, but a small reduction may make a difference in obtaining or losing a contract by the industraliist. Appreciable price reductions were made in the London and Home Counties area in 1929/30 as shown in the J.E.A. report, also reviewed this week, but the reductions per kWh for power were only 40 per cent. of those allowed to lighting and domestic consumers. Next comes the giving of skilled advice to power consumers to enable them to reduce their cost of electricity by improved drives, elimination of shafting, &c. We suggest that existing

agreements should be overhauled with a view to easing conditions that may be more onerous to consumers than was originally anticipated. Among these are minimum payments (which could be aggregated over several years), guaranteed load factors, annual demand charges (which could be made in respect of short periods), and even coal clauses. A chance also presents itself to grant rebates to consumers with high power factors.

The reorganisation of works of existing consumers to make a better use of electricity or the installation of motors by new consumers may be beyond their present means, but the supply undertaking can in many cases help by providing mains, transformers, motors, and other electrical gear, free of cost (at any rate for the time being), and subject to a simple agreement to use only electricity supplied by the authority without further restrictions (again for the time being). In each area there will be different problems to face, but by making a gesture of the kind referred to, with the backing of makers of plant, the supply undertakings will not only increase the use of electricity in industrial works, but will also create an atmosphere of good will that will be found a valuable asset when trade revives.

More Power Station Emissions.

WITH every wish to credit the L.C.C with a single-minded desire to protect the health and other interests of the citizens of London, it is a little difficult to understand the latest phase of its opposition to the Fulham station. The admitted evils of grit and sulphur having been disposed of satisfactorily, yet another ground of objection to the scheme must be found somehow, and the dangers of carbon dioxide and of carbon-monoxide are invoked.

PROFESSOR J. S. HALDANE in the *British Medical Journal* declares that the result of "pouring down cold and heavy gas in immense volume on the people round the station" would "probably" be the poisoning of hundreds of people. DR. G. C. SIMPSON, director of the Meteorological Department of the Air Ministry, has shown that it is not a physical possibility for the fumes to fall immediately on emission from the chimney, and that the heating of the fumes (chilled during the sulphur-elimination process) before emission into the air would give no advantage at all. Any further addition to the cost of the power station to meet the present agitation would be quite unjustifiable.

Electric v. Gas Lighting.

WE think it was at a recent meeting of a gas undertaking that gas lighting in some connection was paid the tribute of being so good as to look like electric lighting. The electrical industry may justly enjoy the compliment. The urge given to the gas by the electrical people in respect of lighting has certainly resulted in notable improvements in recent years. While we do not fear the possibility of gas lighting ever being as good as electric lighting, especially when account is taken of the enormous advantages by way of convenience and cleanliness, it is for the modern electrical industry to maintain the gulf between the two methods of illumination as wide as possible.

Over-confidence is, to say the least, risky, and it is vitally necessary for the electrical industry to keep as close an eye on what the gas industry is doing, as that with which the electrical activities are obviously being watched.

The Commercial Traveller.

IN his speech at last Friday's annual dinner of the Electrical Trades Commercial Travellers' Association, SIR FELIX POLE said that he would refrain from talking about salesmanship. His audience was visibly gratified, for it is now the custom of speakers to seize every opportunity (or even to make one) of belabouring the traveller or representative for his lack of initiative, knowledge, and indeed of everything that goes to make a salesman. No doubt salesmen, being human, have their weak points, but to condemn them wholesale is to ignore the difficulties with which they are faced in these troublous times. Generally speaking, they are a hard-working section of industry; they form a valuable link between manufacturers and their customers; and, as Sir Felix said, they deserve well of their employers and the community. Moreover, it is just possible that some of them know their business.

Continental Appliance Markets.

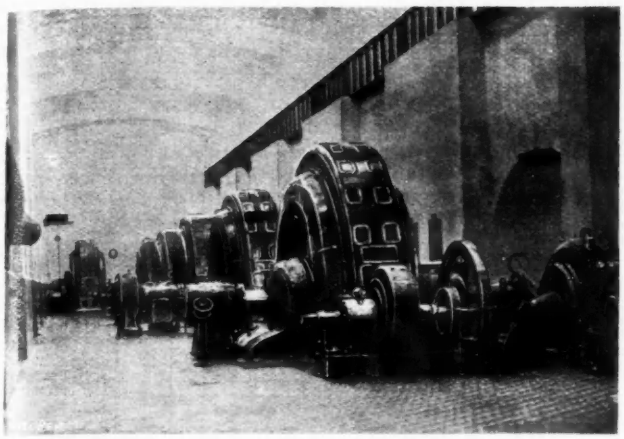
A FEW months ago (October 17th, 1930) we reviewed reports by D.O.T. officials on the French and Spanish markets for domestic electrical appliances; in this issue two further reports covering Italy and Portugal, are dealt with. The earlier article showed that, although they are by no means open markets, France and Spain offer opportunities to British manufacturers of certain lines. There is, perhaps, not so much promise in the markets with which we are now concerned, but in Italy, at least, the position is not hopeless. During the past year or two, exports of British electrical machinery to European countries have increased, showing that its efficiency and reliability are appreciated by Continental industrialists. It would seem that the public of both of these countries might be educated to appreciate the similar qualities of British domestic electrical apparatus. The markets are close at hand, and it should be possible to find reliable agents in some of the more important cities, who, with the proper backing, could justify their appointments by bringing business to British appliance makers. For the information of the sceptics we may say that we are constantly hearing of sales of British electrical equipment in what are regarded as "impossible" markets; while at the British Industries Fair we were told by a representative of one of the exhibitors that his company was supplying boiling rings to Germany!

Horticultural Illumination.

THE application of artificial light as a means of stimulating seedling growth and inducing fuller development of the maturing plant has been a subject of considerable interest to, and of some contention amongst, horticulturists for some time. Hitherto so-called "white" light has been employed, usually emitted by an incandescent electric lamp; but it seems that the heat generated by the glowing filament also plays a by no means insignificant part in promoting plant culture, although light itself assists materially at some stages of the plant's development. Each plant, however, apparently needs its "light diet" to be correctly administered individually, and the value of reflectors and diffusers for even distribution of illumination should not be neglected. Some remarkable effects appear to have resulted from the exposure of plants to the deep-red light produced by neon-gas tubes. According to Messrs. PHILIPS, the Dutch lamp manufacturers, such light induces strong formation of chlorophyll and corresponding foliage luxuriance, due to the fact that the assimilation of carbon-dioxide is at its maximum in red light. Moreover, since neon tubes do not radiate much heat, powerful illumination may be applied without fear of overheating; whilst another advantage is that neon light is a cheaper medium, its production involving less energy consumption than white light does.

Important Battery Litigation.

IT is many years since the electrical industry allowed itself the luxury of a prolonged law-suit. Such a case, and one of absorbing international interest, is now occupying the attention of the Courts. We commence a summarised report in our "Legal" section to-day. We understand that the hearing is likely to last for some time. There are various points at issue. It is interesting to note that the first witness was MR. CHARLES EDISON, son of MR. T. A. EDISON, and president of the plaintiff company.



A Swedish Hydro-Electric Scheme.

The installation at Porjus is claimed to be the most northerly one in the world, and the second largest in Sweden.

By GEORGE WILLOCK.

PORJUS, the site of the most northerly power plant in the world, is situated on the Lule River, 46 miles north of the Arctic Circle. The power station is one in the chain of large hydro-electric installations run and owned by the Royal Board of Water Falls of Sweden, and also the second largest hydro-electric scheme in that country. The station not only supplies electrical energy to the railways, but also to the mines and other industrial concerns in the surrounding districts. In 1929 the total output was 212 million kWh.

The falls at Porjus, fig. 6, consisted of a series of rapids covering a distance of some 10 kilometres, stretching from the outlet of the Great Lule Lake to the still water level in Small Porjus-selet, some 2 kilometres below the site of the present power house, the total fall being 56 metres (183½ feet).

The catchment area of the Lule River at Porjus is 9,900 sq. km.; the minimum flow, unregulated, is 24 cu. m. per sec.; after regulation of Lake Lulejaure and the lakes above Suorva the minimum flow is 90 cu. m. per sec.; and the maximum flow is 1,500 cu. m. per sec.

At the lower end of Great Porjus-selet the dam is constructed, thereby raising the level of Porjus-selet, so that practically the whole head of the Luspe Rapids is available with a storage capacity of 1,000 million cu. m. The dam has a length of 1,250 m., and consists of three main parts, *viz.*, a long length of earth and stone dam running from north to south and provided with a spillway 82 m. wide; the eastern spillway, 116 m. wide, and the roller dam; and a portion turning south at an angle of 90 deg., forming the intake. Fig. 1 shows the eastern spillway and the roller dam under construction. Both the eastern and western spillways allow for an overflow level of 343.50 metres, but they are provided with removable trestles which allow of raising the level to 346.00 metres. The ends of the roller are fitted with gear-wheels, which mesh into racks placed on the downstream side. The roller dam is manœuvred by means of a winch mounted on one of the pillars and driven by a 6-h.p. electric motor. The dam at the intake is built as a solid concrete wall, and is erected in such a position as to exclude any danger from ice pressure. The upstream side is practically vertical, and at the deepest part it has a height of some 15.2 metres.

The two inlet tunnels, only one of which has so far been completed, will have a sectional area of 50 sq. m. The first tunnel has a total length of 520 m., while the second tunnel will be 670 m. long. The tunnels lie below the head-water level for their entire length, and are given a gradient of 1 in 800, which compensates for the loss of head with the maximum flow of water. The tunnel to the first installation is provided with a sluice-gate placed some 20 m. from the inlet.

The water leaving the tunnel enters the distribution chamber or forebay, fig. 4, blasted in rock and lined with concrete on the bottom and the sides. An overflow shaft connects the distribution chamber with the tail-race to take care of high water levels as the result of severe load reductions. The water from the distribution chamber passes through openings 7 m. wide by 4 m. high to the respective tube intakes. The seven inlet tubes at present installed are 3.5 m. in diameter, but it is proposed to make future tubes 4.2 m. in diameter.

The power house is shown in section in fig. 4. The machinery hall as at present excavated is 92 metres

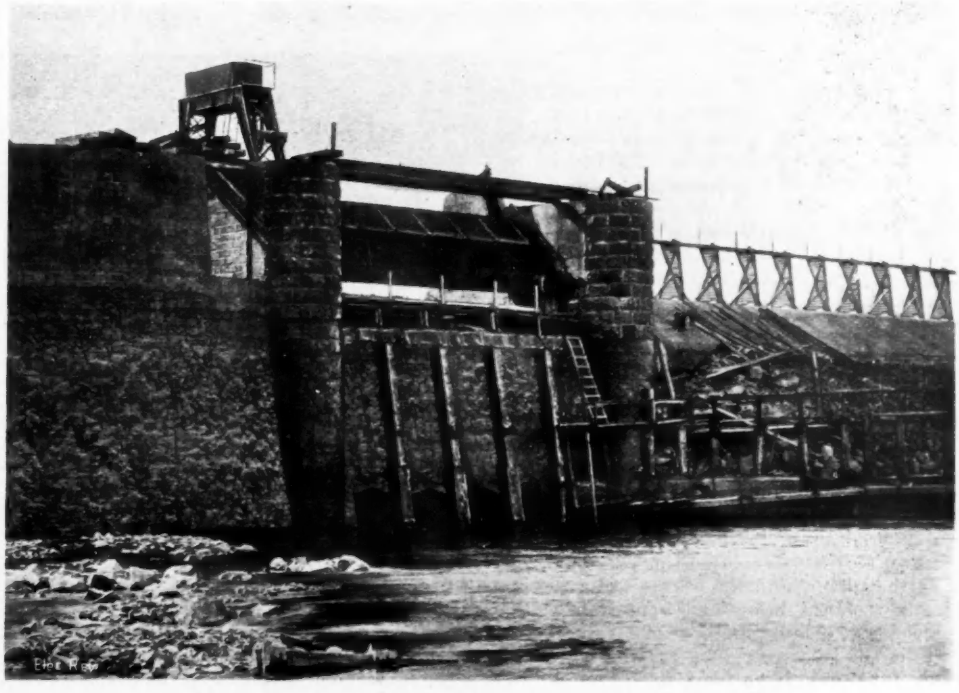


Fig. 1.—Eastern Spillway Roller Dam Under Construction.

long by 10 metres wide, and along the one longitudinal side there are seven recesses, each 15 metres long by 6 metres wide, for the turbines. There are at present installed seven twin-cased Francis turbines and one exciter unit as follows: One 14,000-b.h.p. unit, 225 and 250 r.p.m.; three 12,500-b.h.p. units, 225 r.p.m.; two 15,700-b.h.p. units, 250 r.p.m.; and one 18,000-b.h.p. unit, 250 r.p.m. The exciter unit is of 525 b.h.p. and runs at 500 r.p.m. All these machines operate under a net head of 53 metres.

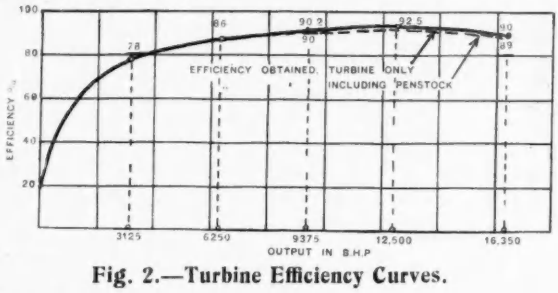


Fig. 2.—Turbine Efficiency Curves.

Each inlet tube is connected to the corresponding turbine casing by a short steel-plate neck. The pressure casing is of 30 mm. steel plate, with end covers of cast-steel, and the whole guide apparatus is of cast-steel. The cast-steel runners each have nineteen blades cast in the rim and boss. The water, on leaving the runners, enters the draft chest, and from there through the draft tube to a tail race tunnel common to all units. The turbine shaft is carried in two bearings, the rear one being of the combined journal and thrust type. The bearings are water cooled and carried by supports bolted to the turbine crown-plates. Between the turbine shaft and the generator there is an intermediate shaft carried by a ring-oiled water-cooled pedestal bearing.

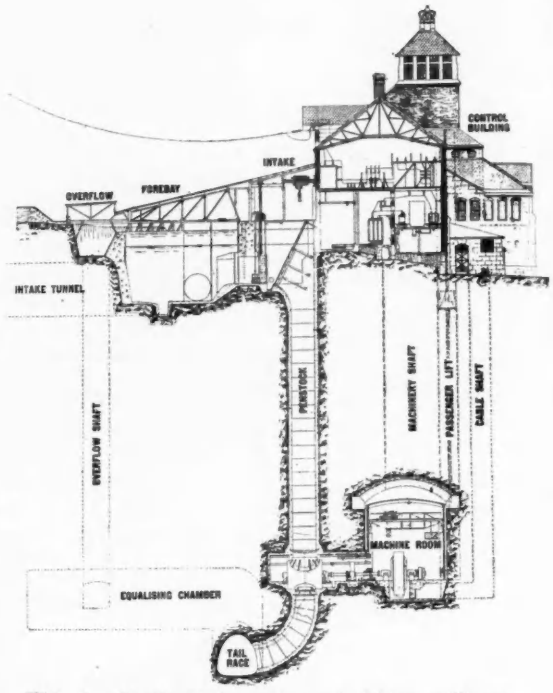


Fig. 4.—Sectional Arrangement of Power House.

Fig. 3.—Tail-race Tunnel.

The governors are of the automatic oil-pressure type, each consisting of the servomotor, the oil pump and pressure receiver, and the governor head with regulating valves and compensating mechanism. The servomotor is placed in front of the turbine, underneath the bearing and at the floor level, and is operated by oil pressure supplied by a gear pump belt driven from the turbine shaft. The pressure receiver is placed immediately above the pump, and the oil reservoir is sunk in the floor below and immediately to one side of the oil pump. The governor head is of the combined spring-and-weight type, running on knife edges, and is driven by a separate belt from the turbine shaft, see fig. 5. The support underneath the governor head contains the valves necessary for the operation of the gear. The levers shown allow for hand regulation and changing over from hand operation to automatic operation, or *vice versa*. This change over can take place while the turbine is running without the slightest disturbance to the speed. The exciter unit is of the horizontal type with automatic oil-pressure governing, and it is fed by a separate inlet tube adjacent to unit No. 5. The efficiency curves shown in fig. 2 were plotted from the test results on the 15,700-b.h.p. unit, and are typical of all the sets. On leaving the draft tubes the water passes through the long tail-race tunnel common to all units, fig. 3. There will be eventually two tail-race tunnels, though at present only one has been excavated. This tunnel has a sectional area

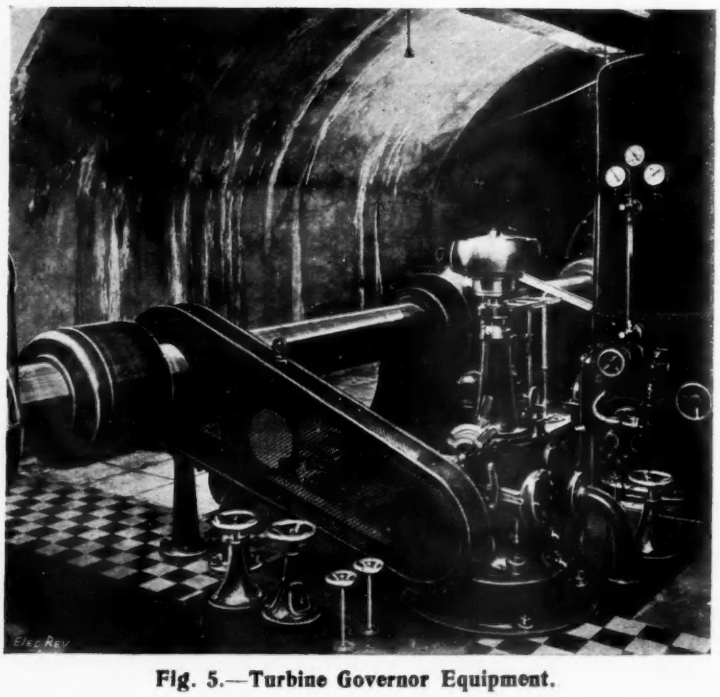


Fig. 5.—Turbine Governor Equipment.

over its main portion of 50 sq. m. The outlet to Small Porjusselet is lined with stone-faced concrete walls with grooves for wood closing doors.

There are nine alternators, four single-phase and five three-phase. Turbine No. 1, 14,000 b.h.p., is connected up to one single-phase, 10,000-kVA, 15-cycle machine, 225 r.p.m., and one 13,500-kVA, three-phase, 25-cycle alternator, 250 r.p.m. Turbine No. 7, 18,000 b.h.p., is directly-coupled to two three-phase generators, one 13,500-RVA, 25 cycles, and one 9,000-kVA, 50 cycles. The single-phase machines each have a continuous output of 6,250 kVA, 4,000 volts, while the continuous output for each of the three-phase alternators is 11,000 kVA, 10,000-11,000 V. The exciters for the single-phase alternators are directly connected to their respective units, with the rotors overhung outside the generators outboard bearings. For the three-phase system the exciters are separate units carried on supports placed outside the generator bearing.

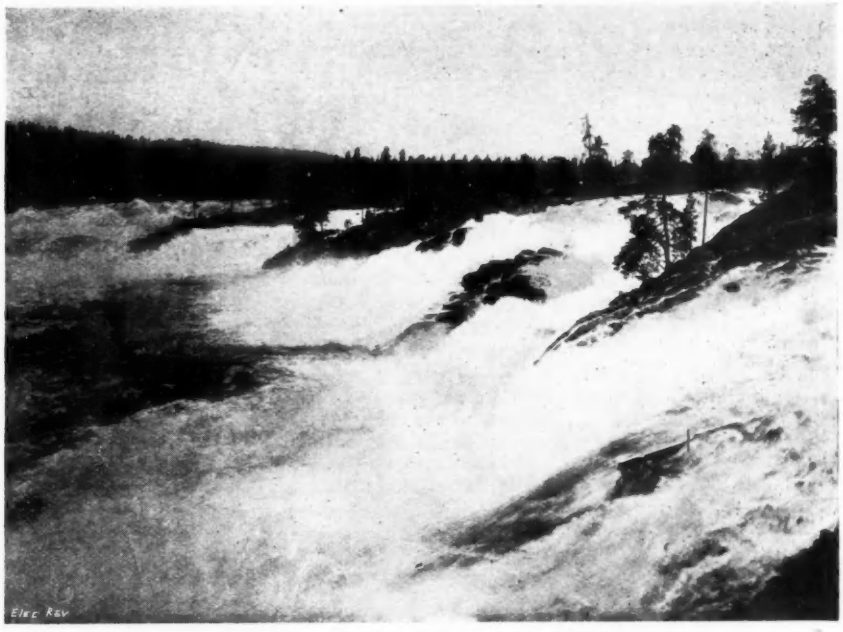


Fig. 6.—The Waterfalls at Porjus, in Sweden.

The control building is the only part of the power house visible above ground, and it contains the transformers and all other electrical equipment for both the single- and three-phase systems, pumping chambers, control room, offices and workshops. Three shafts, fig. 4, connect the instrument room with the machinery hall. The largest of these is the hoisting shaft, 40 sq. m. in area, used for raising and lowering the machinery. There is also a shaft containing a passenger lift, and one housing the cables from the generators. Above the hoisting shaft there is a 50-ton travelling crane with a lift of 57 metres.

There are seven transformer banks: four single-phase, 10,000 kVA, 4,000/80,000 volts; two three-phase, 13,500 kVA, 10,000/70,000 V, 25 cycles; and one three-phase, 3,000 kVA, 6,600/50,000 V, 50 cycles. The transformers are water-cooled, oil insulated, totally enclosed, and provided with distance thermometers, so that the temperatures can be read in the control-room.

The transmission lines cover a large part of Lappland and extend south some 500 kilometres. Apart from the single-phase transmission lines for the Riksgränsen Railway, there are 145 km. of transmission lines for the three-phase, 70,000-V system, and 345 km. for the three-phase, 40,000-V system.

The principal contractors for the power house equipment were: roller dam and complete turbine and governor equipment, Nydqvist & Holm A/B, Trollhättan; alternators, Allmänna Svenska Elektriska Aktiebolaget, Västerås; single-phase transformers, Luth and Rosén Elektriska A/B., Stockholm; and three-phase transformers, switchboard equipment and transmission-lines material, Allmänna Svenska Elektriska A/B., Västerås. The transmission lines were erected by the Royal Board of Water Falls.

Research Committee's Report on Atmospheric Pollution.

Evidence of a Slight Trend in the Right Direction.

The sixteenth report, for the year ended March 31st, 1931, on the investigation of atmospheric pollution, has been issued by H.M. Department of Scientific and Industrial Research (H.M. Stationery Office, price 4s.). Domestic smoke is now well recognised to be the principal contributory cause of the air-pollution nuisance in many towns.

Apart from the powers given to them under the Public Health (Smoke Abatement) Act of 1926, a number of authorities are taking active steps by enlisting the co-operation of house dwellers and factory owners towards smoke abatement. Estimates for London and Glasgow have shown that smoke in these cities is 2½ domestic to 1 industrial and 3½ domestic to 1 industrial, respectively. The burning of every ton of raw coal in a domestic open grate has further been estimated to cause 10s. worth of damage in many areas. Evidently the town dweller must sacrifice his cheerful coal fire if he is to gain the benefit of a clear atmosphere, and many local authorities are doing what they can to induce this necessary spirit of self-sacrifice. Visibility at Valentia, on the S.W. of Ireland, is affected by smoke from industrial areas 350 miles away; the Research Committee has set out to get more information about the spread of pollution by an investigation in progress at Norwich, and it also refers to the development of apparatus for measuring sulphur, the most actively destructive element of pollution in the air; it has been specially designed to be simple in operation and suitable for routine measurements. A comparison from 1915 to 1928 showed that while there was a progressive improvement down to 1921-22, if the evidence for London and Glasgow applies at all generally, little, if any, advance has been made since. The year 1929-30, however, indicated a trend in the right direction. At Sheffield in November and December of 1929 no ultra-violet light at all was received in the middle of the city, and Rochdale loses as much as 29 per cent. of ultra-violet light during the first half of the year. Monthly deposits at about 70 stations indicate that at 25 there were deposits at the rate of 300 tons, or over, per square mile during the year, while even the lowest deposits recorded are of the order of 100 tons per square mile per annum.

Ultra-violet light is also discussed in an appendix to the report.

What is a Perfect Tariff?

It is argued that quantity as a basis for a two-part tariff is superior to "social" or "economic" considerations.

By J. RUTHERFORD BLAIKIE, M.I.E.E.

THE third attempt of the Electricity Commissioners to get some degree of uniformity into electricity tariffs, by means of a committee, cannot be described as happy.

It will be remembered that the first advisory committee, in 1926, failed to find that any existing tariff was better than any other. The second committee (rural supplies) saw no reason why rural tariffs should differ from existing tariffs, and the third committee finds that "size of house" is the best basis for a service charge, in domestic supplies. This finding is unfortunate as the Commissioners, in the meantime, have expressed their approval of three other forms of tariffs, and passed over "floor space," which seems to be about the same thing as "size of house." The three tariffs approved by the Commissioners were:—

1. Service charge based on rateable value.
2. Service charge based on number of rooms wired for supply.
3. Service charge based on wattage of lighting installed.

It is worthy of note that all parties advocate two-part tariffs with an option to consumers of flat rates, but two committees differ from the Commissioners as to the scale of the flat rates; the committees propose high flat rates and the Commissioners the equivalent. The reason for offering these flat rates is because the two-part tariff is imperfect. It is agreed that flat rates are also imperfect, and if these can be used without any alternative it is not very clear why the imperfect two-part tariff must have another imperfect tariff as an alternative. This imperfection of tariffs is greatly stressed and raises the question: What is a perfect tariff? Without going too deeply into the question I suggest that the difficulty arises from different conceptions as to what a tariff ought to be. There may be many such conceptions, but let us consider two.

The first we may call the "economic" tariff, which aims at charges approximating to the cost of supply. The general effect is to raise expectation of a low average price and a large consumption per head of population. The second may be termed the "social" tariff, which aims at the greatest number of consumers at the lowest possible rate. The result may be to raise the average price and possibly restrict the consumption per head of population. The two familiar cries are "cheap and abundant supplies," to be demonstrated by overall statistics, and "cheap and attractive tariffs," to be demonstrated as the lowest minimum rate. The first may be described as "sound business" and the second as "live business"—more speed and more risk.

The economic tariff is, and always will be, far from perfect because it is not possible to take all the factors of cost into consideration. Perhaps the most accurate form yet proposed is a three-part tariff:—

(1) A charge per consumer, covering the cost of the service cable meter reading, rendering accounts, &c.

(2) A charge per kW demanded.

(3) A charge per kWh supplied.

This three-part tariff is hardly practicable, but it may be mentioned to indicate the imperfection of the two-part economic tariff, which is blessed with the decorous word "equitable." It is recognised by all the authorities and cordially disliked by all the consumers.

The social tariff achieves success by subsidising one class of consumers at the expense of another class. In the eyes of the economic school it is flagrantly imperfect; it is not equitable. The social school, however, has to admit some other imperfections in the two-part tariffs so far available. They are usually very limited in scope, *e.g.*, to domestic supplies only, or they permit of very awkward anomalies, especially in the rateable value tariff. The earliest and perhaps the strongest application of the social tariff is the method of charging different rates depending upon the purpose for which electricity is used, such as 5d. per kWh for lighting houses, 4d. for shops, 1d. for power, &c. It requires a separate meter and wiring for each purpose. But it is easy to cut the 5d. down to 4d. or even 3d. if power rates at 1d. produce sufficient surplus. The popular reputation of an undertaking is always based on the comparison of the highest rates charged and not on the lowest average price obtained.

Some few years ago Mr. S. E. Fedden showed that a residential area in Sheffield was supplied at an average rate of 3.365d. per kWh, making a loss of 1.25d. per kWh, or 26 per cent. below cost price. An industrial area was charged 1.288d. per kWh and made a profit of 0.186d. per kWh, or 16.9 per cent. (the consumption in the latter case was about 24 million kWh against half a million in the former). This scheme, of course, is only workable when there is an industrial area to milk; for purely residential areas another method is available, known as the rateable value system. In this case the more wealthy consumers, being more highly rated, subsidise the less affluent. The rateable value system is sounder than purpose tariffs, as the subsidy derived from industrial consumers is liable to evaporate in times of trade depression.

This is putting the case rather baldly. There is a good deal to be said about the ends justifying the means, &c., but the point, at the moment, is that any committee representing assorted views as to what tariffs ought to aim at cannot criticise and assess values to a collection of miscellaneous tariffs without first ventilating ideas and possibly agreeing upon some sort of compromise. Can anything be done to clear the atmosphere? Would the Commissioners be prepared to recommend that the social tariffs should be curbed in any way, that small lighting consumers should have their rates raised, where necessary, to make them more nearly self supporting? Where there is a popular outcry against one authority charging 7d. per kWh whilst its next neighbour charges 3d., the 7d. rate might be quite proper, and the 3d. rate most improper from the economic point of view.

Amongst the three forms of tariffs approved by the Commissioners it will be observed that there are one social tariff and two economic tariffs, the latter of a rather crude order. There is nothing to show whether the Commissioners recognise the difference between these tariffs, or whether this selection may be taken to mean that the Commissioners would view with favour a tariff compounded of one part social and two parts economic, if such a tariff were forthcoming.

The modern two-part tariff is compounded of the original two-part economic tariff and the flat-rate or purpose tariff. The original economic tariff was designed for lighting. It was a charge based upon the wattage of lamps installed, plus a low charge per kWh supplied; such a charge might be anything from 2d. to ¾d. per kWh. Later on the flat rate of 1d. per kWh for power became general, and still later heating was charged at a similar rate. Now if it is arranged for the lighting kWh rate to be 1d., all these 1d. kWh for lighting, power, and heating can be added together and we get the "all-in" or domestic tariff. We have already

seen that the flat-rate or purpose tariff tends to become a social tariff, and, if we judge it on the relative quantities, this particular form of domestic tariff, *viz.*, a service charge based on wattage of lamps installed, becomes a tariff compounded of, say, one part economic to three or four parts social.

The rateable value tariff is compounded of two social tariffs of different classes. Tariffs based on floor space, or size of house, are supposed to be related to wattage of lamps installed, but there is a difference; the consumer is charged upon a rough average, but is free to install as many lamps as he pleases without raising the service charge. In this case we see a further lapse from the economic element.

The third committee, recommending the size of house basis, points out that to each consumer the tariff becomes a quantity tariff; that is to say, the price per kWh varies inversely with quantity used. The same is true of the rateable-value tariff. This is very good in its way, but it is strictly limited to domestic houses. The basis of lamps installed has a larger scope and could be applied to shops, whereas the floor space is no criterion of the lamps installed.

It is interesting to note that the purely economic tariffs are unpopular with consumers. They were the first two-part tariffs, and it was supposed that the "two partness" of the tariff was the objectionable feature. The later two-part quantity tariffs, however, are found to be quite popular, so that it appears that it is the *economic* feature that is really disliked, unless it is associated with quantity. This leads to the conclusion that a quantity tariff, which after all has some economic features blended with some social expedients, might serve a useful purpose.

Marketing the Goods.

The Growing Importance of the Commercial Side of Electricity Supply.

By J. C. PETERSEN, A.C.I.S.

Secretary, South Shields Corporation Electricity Department.

THE activities of the Central Board in connection with the transmission grid will soon be a *fait accompli*.

The enormous amount of capital involved makes one wonder when this colossal sum will have a revenue-earning capacity such as will meet all charges and give us a cheap supply of electricity. The Central Board will certainly be in a position to deliver the goods, but will the industry be in a position to take delivery? The question of a Marketing Board has already received consideration in different directions, and the sooner the industry inaugurates highly-organised sales departments with intensive activity, the sooner the huge expenditure involved will be yielding the due return.

It is, therefore, in the interests of the industry that full use should be made of the commercial side, and further, that the commercial side should have adequate representation on the National Joint Board and the various District Joint Boards, or else that the idea of a National Commercial Electricity Council for the Electrical Industry should receive immediate consideration. So far the commercial side is the only section of the industry that has not fair representation. The workmen have the National Industrial Council and District Councils, and the technical staffs have the National Joint Board and District Joint Boards; but what is, and what will be, a more and more important section of the industry—the Sales Department—has none; in fact, its activities are retarded owing to non-representation on a recognised body.

It will be admitted that there are many directions in which the commercial side could assist the industry at large, namely, the consideration of financial questions, the greater exploitation of showroom sales, these including hire-purchase, deferred payment and similar schemes; also assisted-wiring schemes, which have so far met with considerable success. Assisted wiring is so important a matter that the Electricity Commissioners have issued a memorandum thereon. Here let me mention a point of special interest. A provincial undertaking introduced an assisted wiring scheme some years ago, and a saturation point of 85 per cent. has now been reached. The meters were of the prepayment, 1d. in the slot type, and calibrated for 6½d. per kWh, 4½d. per kWh being charged for energy, and 2d. per kWh charged for installation cost until the original cost is paid. As time went on, the supply was reduced to 3½d. per unit, and instead of changing the coin gear of the meters, the consumer obtained a cash rebate of 1d. per kWh, which was greatly appreciated. Another scheme was introduced in connection with this rebate which has met with most remarkable success, that is, one under which consumers can purchase any apparatus within a reasonable figure, such as irons, shades, lamps, hot-plates, &c., and pay for these out of their rebate. They are supplied with a card and the meter readers simply credit the rebate against the debit instead of handing the cash over. There are 8,000 accounts opened, and it may be mentioned that these customers are not "Birds of Passage," as invariably when one account is paid off another is opened. This means considerably increased consumption as well as showroom sales. Another scheme has been introduced recently, which so far has the appearance of being a success, and, further, promotes the sale of energy. The scheme is as follows:—As many of the installations will soon be paid for, the question of maintenance arises. Some doubt exists as to whether the landlord will meet maintenance or whether the tenant will. To get out of this difficulty, however, the consumer signs an order for maintenance, repairs or any extensions, plug points, &c., and the cost of these is again taken out of the rebate. A separate card is made out, and in order to avoid any complicated book-keeping, the consumer, who has two accounts, one for showroom and one for maintenance, has the rebate equally divided between the two accounts irrespective of the amounts. There is no doubt whatever that the use of electricity in the home for purposes other than illumination is still lagging, owing no doubt to the high cost of the various apparatus and in many cases owing to the prohibitive charges for energy and also complicated tariffs which the householder does not or will not understand. In fact, complications raise suspicions; this can be avoided if the keynote of electricity tariffs is "Simplicity."

The British Electrical Development Association has done whatever is possible with the limited amount of money contributed to its funds. The useful work of this Association should be still further supported not only by the various supply authorities, but by the many allied industries, and E.D.A.'s efforts could be augmented by the formation of a National Commercial Electricity Council and subsidiary District Councils which could deal with many matters outside the province of E.D.A. Such a body would create a wider field in which the massed energy of all connected with the industry could participate, not only parochially but nationally.

Emotional Stimulus.

A New Resistance-capacity Method of Measuring Psycho-galvanic Reflexes.

By G. G. BLAKE, M.I.E.E., F.Inst.P.

SINCE Veraguth, of Zurich (refs. 1 and 8), showed that in response to an emotional stimulus the electrical resistance of a human being decreased, many workers have investigated this phenomenon.

There are in vogue two outstanding methods of measuring these resistance changes.

Bridge method.—The early workers used to employ a standard Wheatstone bridge; later, it was redesigned in the form of an instrument known as the " Emotometer " The latter reduced the number of controls needful for adjustment to five. In 1928 (refs. 2 and 3) the writer designed the thermionic " Reflexometer," which further reduced the controls to two; one of the latter, when once adjusted, could be left permanently set, so that in actual use only one control was employed. For either method it was only necessary to apply a potential of about two volts to the subject, who therefore felt no sensation, nor was there any chance of injury to the skin. One troublesome feature was present, however, in both these methods; *i.e.*, throughout each series of observations a steady drift of the galvanometer* readings took place across its scale, which necessitated continual readjustment of the bridge in order that the galvanometer should read zero at the commencement of each galvano-reflex measurement. The single control of the thermionic " Reflexometer " made it comparatively easy to cope with this difficulty; but, even so, it required considerable skill in adjustment and there was the danger of the human element creeping into the calculations.

The " Tchometer " method.—This method (ref. 4) completely eliminated the galvanometer drift. It consisted of placing the hand of the " subject " in series with the primary circuit of a specially wound transformer (the secondary winding of which was wound to match the resistance of the galvanometer employed) and a potentiometer, or battery. A voltage of from 15 to 20 was, however, required, which gave the subject noticeable sensations and often, in the case of a subject having a sensitive skin, blistering was produced. The great advantage of this method was that the slow drift current failed to register, so that the galvanometer rested at zero before, and returned to zero after, each galvano-reflex.

New resistance-capacity method.—The writer has devised a resistance-capacity method shown in fig. 2, which allows of the application of very low voltage to the subject; obviates the necessity for the employment of a specially wound transformer; and, owing to the large amount of amplification obtainable, also allows of the use of a much less sensitive, and therefore more robust, galvanometer. Fig. 1 illustrates the method in its simplest form and figs. 2 and 3 show how amplification is obtained. This arrangement, fig. 1, so far as results are concerned, is equal to the " Tchometer " method; it eliminates the galvanometer drift, but, like the latter, it requires the application of a comparatively high voltage to the subject.

The following details may be of use to anyone wishing to make use of this method: X represents the subject's hand with pure tin electrodes applied to back and front through pads of lint soaked in a saline solution; B is a battery, or potentiometer, supplying at from 15 to 20 volts; R is a resistance of 5,000 ohms; C is a 2-mfd. condenser, and G a galvanometer.

Fig. 2 illustrates the addition of two stages of amplification. If amplication is not required, the galvanometer is connected as shown at G. For one stage of amplification it is connected across the resistance R_1 as shown at G_1, and when two stages of amplification are required it is connected as shown at G_2. The sensitivity of the galvanometer can be controlled either in the usual way by a shunt resistance, or its readings can be governed by a reduction or increase of the potential applied to the subject.

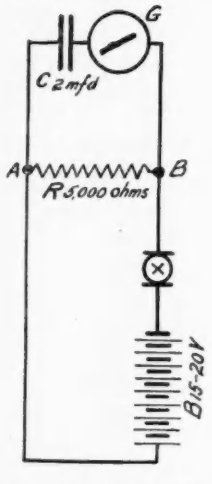


Fig. 1.—Simple Circuit Diagram.

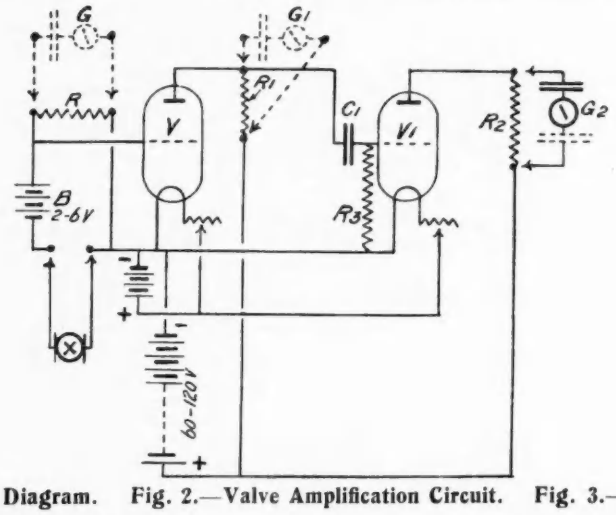


Fig. 2.—Valve Amplification Circuit.

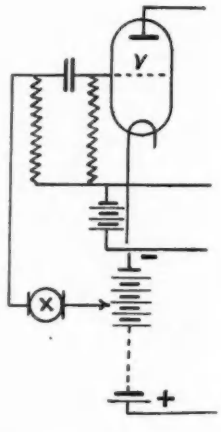


Fig. 3.—Common Battery Circuit.

In addition to the advantage arising from the elimination of the galvanometer drift, this circuit is much more simple to operate than a bridge; no balancing of circuits is required. After the subject has been included in the primary circuit, the galvanometer automatically comes to rest at zero, and after having registered each galvano-reflex it returns again to zero.

In order to pass the slow rises and falls of potential with which we are dealing, the condenser c′ must be of large capacity, say, 2 mfd. (the small 0.0005 grid condensers employed for wireless, while suitable for h.f. currents, are useless for this purpose). When valve v′ is first switched on there is a slight delay before the galvanometer settles to rest at zero, which is due to the time taken in charging condenser c′. " Cossor " 6-volt valves No. 610 r.c. are employed; they have an impedance of 80,000 ohms and an amplification factor of 50. The values of the various resistances are as follows: $R = 5{,}000$ ohms, R′ and $R_2 = 50{,}000$ ohms each, and R_3 is a two-megohm grid leak.

In practice it was considered best to employ two 4-mfd. condensers, one on either side of the galvanometer, to

* The writer has recently proved that this drift is due to polarisation.

exclude the likelihood of any d.c. leakage. This method of amplification (or transformer-coupled amplification) would, of course, be applicable to the "Tchometer."

Fig. 3 shows a slight adaptation of the circuit just described whereby the battery B is eliminated and the current through the subject is supplied from the valve anode battery. This arrangement answers quite well, but, as only a few volts are required and the current consumption is almost nil, the writer recommends the employment of a separate battery.

Amongst other workers on the subject the reader is referred to the following:—

(1) "The Electrical Expression of Human Emotion," by A. D. Waller, *Proc.* Royal Institution of Great Britain, Vol. XXIII, Part II, February 4th, 1921.
(2) "The Measurement of Emotions by Means of a 'Thermionic Reflexometer,'" by G. G. Blake, ELECTRICAL REVIEW, Vol. CIII, No. 2661, pp. 882-884, November 23rd, 1928 (this paper gives examples of dual curves and diagrams of circuits).
(3) "Applications of Electricity to Medical Practice," experimental lecture by G. G. Blake, *Journal* of Royal Soc. of Arts, Vol. LXXVII, January 18th, 1929.
(4) The Tchometer method was demonstrated at King's College, London, by F. A. P. Aveling in December, 1928.

The following selected list of published papers are useful for reference:—

(5) "Some New Apparatus for the Psycho-galvanic Reflex Phenomenon," by C. E. W. Bellingham, S. Langford Smith, and A. A. Martin, Australasian *Journal of Psychology and Philosophy*, Vol. VI, June, 1928 (for another application of the circuit given in this paper see "La Cellule de Sélénium Employée avec un Amplificateur Special à Lampes Triodes," *Rev. d'Opt*, 5, 1926, pp. 268-279).
(6) "On the Physiology of the So-called Psycho-galvanic Reflex," by F. A. Aveling, R. J. S. McDowell, and H. M. Wells, *Proc. of Physiological Soc.*, March 21st, 25; *Journal of Physiology*, Vol. LX, pp. vii and viii, 1925.
(7) "Concerning Emotive Phenomena, Periodic Variations of Conductance of the Palm of the Hand," A. D. Waller, *Proc. Royal Society* B91, Vol. XCI, 1919-1920.
(8) "Das Psychogalvanische Reflexphenomen (Berlin, 1900).
(9) "The Emotive Response of a Class of 73 Students of Medicine Measured in Correlation with the Result of a Written Examination," Mary D. Waller, *Lancet*, April 6th, 1918.
(10) "The Measurement of Emotion," Whately Smith, London, 1922.
(11) "Some Applications of the Psycho-galvanic Phenomenon," T. H. Pear, *Discovery*, Vol. 5, pp. 116-119, July, 1924.
(12) "The Effect of the Circulation on the Electrical Resistance of the Skin," F. Aveling and R. J. S. McDowall, *Journal of Physiology*, Vol. LX, No. 4, September 4th, 1925.
(13) "The Measurement of Emotional Reactions," David Wechsler, *Archives of Psychology*, No. 76, New York, 1925.
(14) McDowall and Worsnop, *Journal of Physiology*, Vol. 59, 1925; *Proc. Physical Society*, XXXVI.
(15) Dale and Laidlow, *Journal of Physiology*, Vol. 52, p. 335, 1919.
(16) Fauville, *Archiv. Internat. Physiol.*, 16, p. 58, 1921.
(17) Markbieter, *Proc. Royal Soc.*, B Vol. 91, 1919.
(18) Müller, *Monatschr. f. Psych.*, Vol. 133, 1913.
(19) Schief and Schubert, *Pflüger's Arch.*, 195, 1922.

Wayleaves Over Private Lands.

The Points of View of Landowners and Farmers.

By NORMAN A. WEBB, B.Sc.(Lond.), P.A.S.I., (Chartered Surveyor).

THE progress of rural electrification depends to some considerable extent upon the speedy acquisition of wayleaves at a reasonable cost. This matter gives rise to many and increasing difficulties which are evidenced by the number of applications made to the Ministry of Transport during recent years, the actual figures for the last ten years being:—

Year.	Wayleave awards.	Applications made and subsequently settled between parties.
1920-21	—	—
1921-22	1	—
1922-23	4	1
1923-24	4	3
1924-25	5	1
1925-26	15	5
1926-27	45	6
1927-28	87	11
1928-29	59	30
1929-30	87	41
(to January, 1930)	—	—
Total ...	307	98

Recently the National Farmers' Union has advised its members to refuse to enter into wayleave agreements for overhead transmission lines, and this advice, however open to criticism it may be, will doubtless tend to make negotiations still more difficult. An attempt is made in this article to deal with the subject from the land owners' and farmers' point of view rather than from that of the electrical engineer, in order that the latter may be induced to realise that an owner's aversion from the erection of poles is not altogether unjustified in many cases.

It may be desirable to consider briefly the powers possessed by the electrical undertakers. Section 22 of the Electricity (Supply) Act, 1919, empowers the undertakers to place any electric line below or across any land other than that covered by buildings or used as a garden or pleasure ground, provided that notice of intention is served upon the owners and occupiers together with a description of the nature and position of the proposed lines. Failing notice of consent by the owners and occupiers within twenty-one days, or if objection is made, the undertakers may apply to the Ministry of Transport who will cause an inquiry to be held and who, after giving the parties an opportunity of being heard, may authorise the undertakers, either unconditionally or, "subject to such terms, conditions, and stipulations" as may be thought fit, to place the lines in or over the land. The Ministry, in considering the matter, must have regard to the effect, if any, on the amenities or value of the land of the placing of the line in the manner proposed. Once a wayleave agreement has been made, the undertakers may retain the line in position even after the period mentioned in the agreement unless objection is made by the owner (Electricity (Supply) Act, 1922, Section 11) when it is necessary for the undertakers to proceed as in the case of a new line. Both the undertakers and the owners may at any time, and irrespective of any existing agreement, apply to the Ministry of Transport for a revision of the terms of a wayleave agreement.

In approaching the problem of wayleaves it should be realised that the owner looks upon the electrical undertakers as a commercial body, and he certainly feels no incentive to regard the depreciation of his property and the suffering of personal inconvenience in a philanthropic light. He is probably aware that it is desirable to extend the electricity undertaking and to supply cheap current to the village, but to do so at his expense (though not at the expense of his neighbours) appears to him—and quite rightly so—most unfair.

An owner is usually prepared to be reasonable and accept fair compensation if the undertakers on their part will regard the transaction as a purely commercial bargain. Much trouble has resulted from representatives of electricity companies holding out the inducement of cheap energy which often does not materialise for several years, if at all. It is far better to be perfectly candid, and if no supply can be given to explain the reason.

The dangerous nature of the wires and poles is not as a rule a serious objection, and is one that can usually be overcome by patient explanation. Unsightliness, however, is often an important consideration, and every effort should be made to follow a route which is the least objectionable. It is seldom realised what a serious effect overhead lines near a mansion or crossing a park may have upon the selling price of the property, and the yearly payment of a few shillings or even pounds will seldom compensate the owner for the detriment. Also, over lands which provide good shooting the poles will have a serious effect upon the bag. Land which to an unexperienced observer appears to be simply moorland of very little value may be a very good grouse moor, and the carrying of poles and wires across it will considerably disturb the game. In such cases the wires should be marked with pieces of bunting to avoid the killing of birds. Grouse, in particular, fly extremely fast, and overhead telephone and power cables cause a considerable death roll.

In considering the question of rental, it should be realised that the owner is not simply hiring to the undertakers a very small area of land for the erection of poles and stays, but he is also granting an easement for men to cross his land along the route of the line for the purpose of inspection and maintenance whenever necessary. In some cases it is the practice of the linesman to make a fortnightly or monthly inspection, and he simply follows the route "as the crow flies," making gaps in hedges, damaging crops, and tending to form a more or less permanent footpath across the land. This does not encourage other farmers in the district to agree readily to permit other wayleaves. The gradual function of a footpath may later be claimed as a public right of way, and this will cause considerable damage and great inconvenience to the farmer. The undertakers can remedy this difficulty very largely by giving strict instructions to their linesmen, providing them with an authority, and meeting the wishes of the farmer, so far as possible, as to the route the linesmen should follow. When it is necessary to cross fields diagonally and to pass through hedges and fences, the undertakers should provide suitable gates and see that they are locked by the linesmen after use.

TABLE I.

Schedule of Suggested Scale of Wayleave Based on the Form of Wayleave Agreement.

(*a*) Underground line conductors, 1d. per yard.
(*b*) Overhead line conductors :—

Type of line.	Yearly rental of land per acre.	Rental per leg or stay for poles in arable fields.	Rental per leg or stay for poles in grass fields.	Rental per leg or stay for poles in hedgerows
		s. d.	s. d.	s. d.
Up to 12,000-V line on single A or H wooden poles.	Moorland and waste ground	1 0	1 0	1 0
	10s.	3 0	1 6	1 0
	20s.	4 0	2 0	1 0
	30s.	5 0	2 6	1 0
	40s.	6 0	3 0	1 0
From 12,000-V to 32,000-V line on single A or H wooden poles.	Moorland and waste ground	1 6	1 6	1 6
	10s.	5 0	2 6	1 6
	20s.	6 0	3 0	1 6
	30s.	7 0	3 6	1 6
	40s.	8 0	4 0	1 6
Steel lattice-work poles.	Twice the above scale for each standard, stays the same price.			
Steel towers for 60,000-V lines.	£2 per tower.			

The above suggested rentals do not cover compensation for damage or loss of amenity.

Undertakers generally lay down a schedule of wayleave rentals in respect of different descriptions of land. They vary to some extent in different districts. The Overhead Lines Association suggests the following :—

To the land owner :
For distribution lines (*i.e.*, under 35,000 volts) :—
One shilling per annum in mowing grass or pasture.
One shilling and sixpence per annum in corn or ploughed land.
Two shilling and sixpence per annum on demand when steam ploughed with rope tackle.
For main transmission lines (*i.e.*, over 35,000 volts) :—
Five shillings per annum in mowing grass or pasture.
Ten shillings per annum in corn or ploughed land.
No rent will be charged for supports in uncultivated land or hedge.
No rent will be charged where a supply of electricity is provided to the occupier of the land.
To the occupier :
One-half of the above rates in addition.

The above figures are generally on the low side, and may be contrasted with those in Table I, which were recommended at a conference of the Central Landowners' Association, the Chartered Surveyors' Institution, and the Land Agents' Society to their respective members.

At the same time, however, the Conference pointed out the difficulty of laying down any basis, and the figures quoted are exclusive of temporary damage and also loss of amenity or building value. Also an attempt was made to differentiate between wayleave rentals over land put to the same use but differing greatly in value.

The Electricity Commissioners have been approached on more than one occasion to lay down standard rates, but have refused to do so. The following extract from the seventh annual report of the Commissioners, 1927, is of interest :—

> "The suggestion of the Committee that official recognition should be given to standard rates for wayleaves had already formed the subject of a previous investigation by the Commissioners (Third Annual Report). After a further review of the matter in the light of the applications for wayleave consents made during the past seven years, and of the fact that the Minister of Transport is by statute required to have regard to the effect, if any, of the placing of a proposed line on the amenities or value of the land concerned, the Commissioners were unable to advise the Minister that the Committee's suggestion could be turned to practical effect to the extent of prescribing officially a rigid scale of wayleave rentals of general application."

Statutory undertakers frequently attempt to maintain the same figure of wayleave rentals irrespective of the particular circumstances. Thus if pasture land is scheduled at 1s. per yard wayleave rental, this figure will be adopted for poor pasture, valued at, say, 12s. per acre per annum and again for good pasture valued at, say, 60s. or 70s. per acre. It is argued that if a uniform figure is taken throughout much difficulty is removed, but, in my experience, the reverse is the case. The farmer expects to be treated fairly on his own merits and, because an award has been given of, say, 1s. 6d. per yard run ten miles away lower down the line, does not consider that this is in any way applicable to his own particular circumstances. The undertakers may be successful in persuading the farmer to accept the figure of 1s. 6d., but they may reap an enormous amount of trouble and opposition elsewhere.

In agreeing wayleave rentals it is essential that the person engaged should have some knowledge of farming operations as well as some acquaintance with the value of land. It is believed that much trouble would be saved if undertakers generally would adopt the procedure employed in the case of railways and telephone and telegraph cables of employing a capable surveyor or land agent to negotiate both wayleave and wayleave rentals, either as a full time officer or by employing private firms. The argument against this course is on the grounds of expense, but it is believed that this course would result in economy, inasmuch as a great deal of friction would be removed and the construction work greatly expedited and facilitated. While the wayleave rentals would fluctuate a good deal having regard to the particular circumstances, the total wayleave rent roll would probably not be greater than under present conditions.

Apart from the wayleave rental, difficulty sometimes arises over the form of agreement and as to the owner's costs. As to the former, it is reasonable that this should provide for the making good of damage to the land, buildings, livestock, &c., during the construction and maintenance of the works, and for more interference with footpaths, drains, and roadways, and also for reasonable notice of intention to enter for the purposes of repair. As to the landowner's costs, the agreement should provide that all reasonable expenses to which the owner is put in the employment of a solicitor and surveyor should be made good by the undertakers. The stamp duty will, of course, also be payable by the undertakers.

Australian Tenders.

Estimating as a Fine Art or an Exact Science.

(From an AUSTRALIAN CORRESPONDENT.)

STAY-at-home readers of the ELECTRICAL REVIEW engaged in estimating for electrical plant may sometimes feel, with Gilbert's policeman, that their lot is not a happy one. At such times, no doubt, they find work normally of interest dull and irksome; after the tender has been lodged, they may occasionally find it necessary to check the estimate to make certain they have not forgotten to allow for the spares, freights, erection or other essentials, or to observe that ominous umpteenth clause of the conditions of contract. These individuals when in liverish mood may be invited to contrast their lot with that of their opposite numbers in Australia.

But in addition to the necessity for observing all of the above-mentioned points, an Australian engaged on the preparation of a tender for plant imported from Britain has sundry other nightmare-inducing items with which to wrestle. Armed with his f.o.b. price, he starts off with freight, insurance and landing charges such as wharfage, wharfage entry, stacking, carting and similar minor items. Sometimes "heavy lifts" have to be reckoned with. All these, however, may be reasonably considered as part of the standardised routine and represent more or less plain sailing unless the plant is up-country where rail transport is impossible and the strength of road bridges an unknown quantity.

The question of duty (customs and/or primage) requires more care, while the present position of Australian exchange on London and the Sales Tax imposed by an impoverished Commonwealth Government, are features calculated to demand nerve sedatives when tendering. First considering the duty, this may be resolved into two groups. The first covers duties imposed with the definite object of protecting an Australian industry, and the second is a revenue-assisting primage duty. The rate in the former case is a variable quantity (in many cases prohibitive) and the latter is, at the time of writing, 4 per cent.

Duty, whatever its classification, is calculated upon the f.o.b. price or the ordinary domestic selling price charged for similar plant for use in Great Britain, whichever is the higher, 10 per cent. "loading" being added in each instance. A separate duty is imposed upon the packing cases, and here is to be noted the necessity for proving to the satisfaction of the Customs Department that the cases are of British origin; failing this satisfaction, the higher foreign rates are charged.

The recent depreciation of Australian currency introduces a factor at present under consideration by the Government, namely, whether the British invoice price shall be adjusted to Australian currency and duty levied on that figure plus, of course, the 10 per cent. "leading" mentioned. If, after a tender is submitted, the *rate* of duty is increased, the law makes it obligatory for the purchaser to pay the extra amount involved, but it is questionable if the purchaser could legally be debited with extra duty paid on account of alteration not in the *rate* but in the *method of assessment* on account of the currency position, unless the tender be safeguarded in this respect. Possibly re-imbursement in such a case could only be expected had the tenderer made it an express stipulation and received acceptance of the condition from the customer.

In addition to the ordinary duties already mentioned, the Industries Preservation Acts require "dumping" duties to be paid upon plant gazetted by the Government where it is found that the selling price of a British manufacturer to his Australian representative is lower by more than 5 per cent. than his ordinary domestic selling price for use in Great Britain. The "dumping" duty is calculated by taking the difference between the two values after making the 5 per cent. allowance. There are several other requirements of the Industries Preservation Acts requiring attention.

The next factor to contend with is the exchange on London. The position is that the telegraphic transfer rate selling to London is, on the day this is written, just over 18 per cent. This is actually a nominal rate only, for it is impossible to remit any substantial sums through the banks even if one is willing to pay the rate. At the time of tendering it is impossible to foresee what the exchange rate will be at time of payment, several months hence, but it is obviously imperative that the contractor shall be properly protected in his tender. He may do this by a qualifying clause in his tender or put the onus of remitting direct to Britain upon the buyer.* Minor bank exchanges arise if the buyer is resident in another State to that of the tenderer or, for that matter, if the buyer is outside the metropolitan area of the same State (assuming the contractor to conduct his business in the metropolis). In such cases inter-State or intra-State bank exchanges operate between the two areas, but if one can induce the buyer to remit directly to Britain, they can be eliminated so far as the tenderer is concerned.

Finally, the Sales Tax. This is a recent Commonwealth device for raising revenue and is at present 2½ per cent. This is paid by the seller on sales made to purchasers not registered as wholesalers. There are many entanglements, too numerous to mention here, but one difficulty may be cited. The Commonwealth law requires the seller to pay the tax on all sales made to buyers who cannot quote their registration numbers as wholesalers. Certain State Departments are not registered but, nevertheless, decline to recognise the condition and insist on the price being abated by the amount of the tax on the plea that, at the time the Commonwealth was established, the Federal Constitution established an agreement that State Governments could not be taxed by the Commonwealth Government. In such cases, therefore, the contractor is in a cleft stick; he has to pay the Commonwealth tax without redress from the State Government. One State Government Department announces its determination to fight the issue to the last resort, the Privy Council, if necessary. It will, furthermore, be seen that if a tenderer quotes for plant at a price inclusive of exchange, sales tax may be levied on the cost of the exchange. It is infrequent that a tenderer would so quote but, having plant in stock in Australia, he might feel disposed to quote an inclusive figure for immediate settlement.

It will be observed that the writer has not been courageous enough to mention "profit."

Summing up, the sheer impossibility of submitting "firm" tenders for indent is proved and the estimating man in Britain must admit that working under such difficulties as are only briefly outlined here would tax the patience of the higher mathematician and the lay lawyer. Truly, the lot of the man at home may be comparatively regarded as all "beer and skittles."

But such difficulties add to the spice of life, and with an adequate aspirin supply the Australian tenderer who is amazed one bright morning to receive an acceptance of his tender may later devote his attention, first, to the joys of proving to the customer's satisfaction that the final price adjustments are correct, and, second, to getting paid. He may also feel a vague wonder that a benevolent Government does not impose an amusement tax on tendering.

* The New South Wales Government Railways recently met this point by announcing that all tenders were to be based on the rate of exchange prevailing at the time of their preparation, and provisions have been made for variation in accordance with exchange fluctuations.

Petrol-electric Vehicles.

Electro-mechanical transmission is claimed to obviate much of the power loss involved in a purely electrical system at the higher road speeds.

By J. W. BURLEIGH, A.M.I.E.E.

INTERESTING applications of the electrical drive to internal-combustion engine-propelled vehicles have been made by engineers in different countries from time to time. Although this kind of drive results in much quicker acceleration, smoother running, and less maintenance, its use has been very limited, probably partly due to the extra weight of the transmission gear and partly to the energy losses in the electrical machines at the higher road speeds.

In the light of present-day knowledge of the design of dynamo-elecric machinery and with the excellent materials now obtainable, the electrical machines can be constructed of very small dimensions, light weight, and quite suitable for the purpose. The loss of power in the electrical transmission system at the higher road speeds is approximately 25 per cent., and is certainly a disadvantage of the system. The object of this article is to describe a simple method of control and operation which saves nearly the whole of this loss and results in other advantages.

In the case of the ordinary petrol-electric drive it is the usual practice to provide the dynamo with shunt or compound windings. Sometimes the current for the excitation of the fields is, for the purpose of maintaining stability, derived from a separate exciter. A dynamo provided with series-wound, or substantially series-wound, field coils and controlled by a variable divertor resistance has advantages over other kinds of windings. In practice this method of control is easier from the driving standpoint, and it also simplifies the construction of the controller. A series-wound dynamo is lighter in weight than one wound otherwise, owing to the increased space factor of the field coils. The author first used a series-wound dynamo with divertor control for an ordinary petrol-electric set with an engine of only 25 b.h.p. He has recently used them for electrically driving an omnibus fitted with an engine of 75 b.h.p. with a speed range of from 1,000 to 3,000 r.p.m. In both instances this method of control was found to be very satisfactory and preferable to other methods.

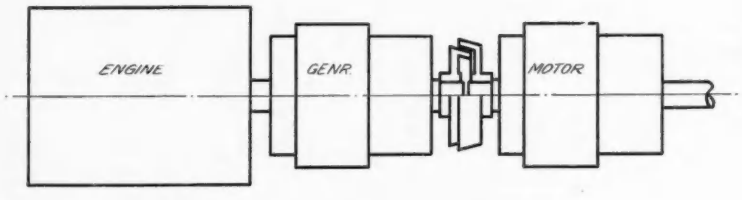


Fig. 1.—Arrangement of Power Units.

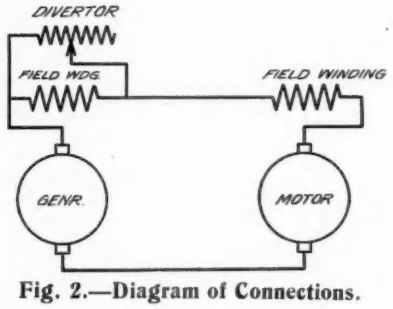


Fig. 2.—Diagram of Connections.

These actual applications are mentioned more particularly because by the use of this arrangement and the simple expedient of providing a clutch, or coupling, as shown diagrammatically in fig. 1, the transmission losses at the higher speeds are avoided. Fig. 2 is a diagram of connections; for the sake of clearness the usual braking and reversing connections, &c., are not shown.

To start the vehicle the movable divertor arm is moved from the extreme left position (which short circuits the generator field) until the dynamo generates just sufficient voltage to overcome the ohmic resistance of the dynamo and motor windings and to permit the flow of the requisite current (of which a portion flows through the series field winding and a portion through the divertor) to enable the motor to exert the necessary starting torque. To increase the voltage of the generator still further, and therefore the speed of the motor, the divertor arm is moved farther towards the right. When it is in the extreme position on the right, the full voltage is generated. To obtain a higher motor speed it is necessary either to raise the engine speed and thereby generate a higher voltage, or to place another divertor resistance in parallel with the motor-field coils in order to lessen the magnetic flux. At the higher road speeds the engine shaft and the shaft in connection with the road-wheel mechanism revolve at the same speeds. When this condition obtains, the clutch is thrown into action and the engine drives direct. With the exception of the energy absorbed by the fans, brush friction, &c., the whole of the engine energy is then delivered to the driving shaft.

The vehicle is always travelling when the clutch is in operation, consequently it is highly important that the dynamo should, as quickly as possible, generate a suitable voltage and current to enable the electro-motor to "pick up" the load at the moment of declutching. Stated differently, the interval between the withdrawal of the engine power when used direct and the application of the power from the electro-motor should be of the shortest possible duration. A generator with a series-wound field and controlled by an adjustable divertor resistance exactly fulfils the above-mentioned requirements.

A shunt-wound dynamo would be unsuitable for an electro-mechanical drive, for it would be sluggish in "picking up"; besides, when the engine is running direct without the electrical machines in operation it would not be well for a shunt dynamo to remain excited. In addition to the excitation watts, there would be iron losses in the armature, and those combined losses would lower the efficiency of the transmission system.

It will be noted that no resistance is required under any conditions in the main circuit; neither is it necessary, except perhaps in special cases, to provide a double-wound armature in the motor for series-parallel control. At the moment of starting the engine may run at any speed within very wide limits, and the power which it has to develop to enable the electro-motor to provide the necessary starting torque is low compared with the power required with ordinary gearing.

In many applications, instead of connecting the electro-motor shaft direct to the road-wheel mechanism, it will be preferable to gear it thereto. In such cases the motor-armature shaft would not form a part of the transmission shaft, but would be placed parallel with it, the pinion being, of course, on the motor shaft and the driving wheel on the transmission shaft. With a comparatively low-speed engine the weight of the dynamo will be lessened by driving it through gearing. In such

a case, and with the electro-motor arranged as stated above the transmission shaft may run between the two electrical machines, one element of the clutch being on the engine shaft and the other on the transmission shaft.

In some cases when the engine does not admit of wide variation in speed, it will sometimes happen that weight can be reduced by providing the dynamo with a double-wound armature and two commutators, the windings being connected in series or parallel for the purpose of obtaining very wide voltage variation. It is, however, much better to use one commutator when it is possible to do so, even at the expense of a little more weight; one of the great aims in the design of an electrical drive is to use the least number of parts in the machines and to make the controller as simple as possible.

A matter that perhaps deserves comment is the fact that only a small amount of the energy expended in driving the dynamo and motor fans when the engine is running direct is lost. It is well known that the resistance of the windings of a dynamo, or motor, when hot is usually about 25 per cent. more than when they are cold. In the case of small highly-rated machines, such as those under consideration, the percentage increase in resistance is often higher. Immediately the engine commences to drive direct the fans rapidly cool the windings, so that when the dynamo and motor are again brought into electrical operation they are much cooler. The average efficiency of the electrical transmission is therefore increased and the fuel consumption will be appreciably lessened, or, alternatively, the dynamo and motor may be of less weight than in an ordinary petrol-electric drive.

The embodiment of a clutch, whether it is mechanically, electrically, or otherwise operated, cannot be regarded as an extra complication, compared with the usual purely electrical drive in which a shunt- or compound-wound dynamo is used, as with those windings the electrical control is much more complicated.

The electro-motor attains its highest temperature rise when the vehicle is ascending a hill. As the speed of the dynamo under this condition is much higher than that of the electro-motor, it is preferable to attach the ventilating fan of the latter to the dynamo shaft. In spite of the coupling in some applications being interposed between the dynamo and motor, it is comparatively easy to arrange for the hot air to be drawn through ducts leading from the motor casing.

The dynamo and the motor may be constructed with one interpole for each pair of main poles, the commutation being perfect under any working condition. In this construction, and when using four main poles, the interpoles are presented to the armature at points diammetrically opposite, a larger space being provided between the two main poles, which are adjacent to each interpole. This design reduces the leakage coefficient and also allows room for deeper windings on the main poles, thereby decreasing the external dimensions and the weight of the machines. Although of very small dimensions, the electrical machines lend themselves to robust construction, and have a very high factor of safety. In many cases the armatures may be bar-wound and the fields wound with a conductor having a rectangular section.

The more rapid acceleration and the unequalled flexibility of an electrical drive, especially for city traffic, weigh greatly in its favour. The avoidance of costly gear renewals (particularly in the case of an omnibus) is also an important consideration. This kind of drive not only has many advantages when used in connection with the ordinary petrol engine, but is also a practical solution of the problem of adapting the heavy-oil engine to road transport.

Proposals have previously been made for electro-mechanical drives, and the lack of their real development has no doubt been largely due to the use of unsuitable windings and methods of control.

Prospects in Southern Rhodesia.

Future Electrical Possibilities.

By DOUGLAS SPENCER.

THE time to secure good markets is in the early stages of a country's development, and although it cannot be expected that in a country with only 50,000 white inhabitants, and those spread over an area much larger in extent than England and Wales, there will be vast municipal electrical developments taking place, the public of Southern Rhodesia is certainly turning its thoughts to electrical amenities.

It is only a few weeks ago that the Rhodesian public in Salisbury celebrated the fortieth anniversary of the arrival of the "Pioneer Column" from the South, and those who have watched colonial developments will know how slowly centralisation into town groups follows the initial stages of development. A town may spring up near a mine, as has happened in the more important mining areas of Southern Rhodesia; the "market towns," as we know them in England, are slow to follow, but they surely come—especially in so highly a mineralised country as Southern Rhodesia.

For the nine months ended September 30th, 1930, the total number of immigrants entering the country was 2,746, the majority of whom will become town dwellers. For the corresponding period of 1929 the number was 2,819.

When one bears in mind the hold which the foreign electrical engineer got on the Union market after the South African war, and during the early part of this century, and the manner in which the American electrical engineer studied the market in India, it is necessary to urge that it is not too early for some group to begin studying the market as it stands, and the manner in which the provision of finance can develop it at a profit now—even though on a comparatively small scale. One has only to peruse the weekly papers to see how the growing towns are calling out for a supply of electricity, and the larger towns for a larger supply. Not because it is terribly cheap: in Gatooma it is 1s. 8d. per kWh, but its uses are many, and its convenience, in a country where labour is black, is very great.

It must always be borne in mind that Southern Rhodesia is a country in which there is an almost unlimited supply of coal, and not only from the Wankie collieries. On the other hand, the problem of using water power is complicated by the occurrence of six winter months, from May to October, which are practically without rainfall. Yet it is a country of large rivers, running in many cases where land for storage could be easily obtained, and where sites on granite formation eminently suitable for the construction of dams are of frequent occurrence. It is in fact ideally the country for "power-cum-irrigation" projects, which could be developed in the midst of territory whose soil, given irrigation, can produce almost anything all the year round.

It is probable that one of the most important developments in Southern Rhodesia will be the export of cattle "on the hoof" on a very large scale to Great Britain. Mention of agricultural prospects in the columns of an electrical paper may perhaps seem out of place, but it is obvious that these are points which the electrical engineer salesman must study on the spot. Northern and Southern Rhodesian markets are easy of study on

the same trip. A glance at the map will show what an area of electrical possibilities a journey from Bulawayo to Victoria Falls, Livingstone, Lusaka, Broken Hill, Bwana M'Kubwa, Sakania, Elizabethville and Bukaina would cover, and those possibilities exist even to-day, while in Southern Rhodesia as a whole the possibilities are opening up with developments already under consideration. The construction of the Walfish Bay Railway is regarded as a necessary certainty. The Sinoia Kafue "cut off" is also a distinct possibility, and it is probable that in order to reduce the expenditure recurring yearly on road repairs in outlying districts a policy of metre-gauge light railway development will be brought under review.

Of actual secondary industries it does not seem likely that there will be any new ventures except possibly the development of a cement works for Mashonaland. The only plant at present is that at Bulawayo, 297 miles from Salisbury, which would make it appear obvious that building operations in the capital and road-making operations in the Eastern Provinces would be rendered much cheaper and more general, if the price of cement did not include a most uncommercially long haul from Bulawayo, towards the Nyasaland and Portuguese East African frontier.

It may be objected that Southern Rhodesia is essentially a country of vested interests, held by a few original settlers and the mining groups who have come up from the Union, with the British South Africa Co. in the background. But it is difficult to see how vested interests, however much they may help the initial development of a country, can be allowed in after years in a self-governing colony, such as Southern Rhodesia, to hinder its development on ordinary and normal lines, when the people make up their mind on a particular line of action, and can find financial supporters in the Old Country, who have the same confidence in this country as their forerunners in its development.

The development of the chrome industry is likely, with the revival of world business activity, to be extended, and may also lead to further railway development, as it has done in the Bauket district. From the transport point of view the industry is, however, in many districts, an extravagant one. The transport and shipment of ore, of about 48-50 per cent. purity, is causing several owners of chrome deposits to look for means of refining in fairly close proximity to the source of supply. These means sometimes exist in the shape of water powers, which, although at the moment only eight-month propositions, might possibly be enabled to work for twelve months in the year with the provision of water storage.

The water powers of Rhodesia have so far received little attention, but it would not be a matter of surprise if in the next few years much closer examination were made of "irrigation-cum-power" projects. Cheap land for storage, admirable dam sites, and the existence in the neighbourhood of rich agricultural land set amidst excellent grazing land may bring about some of these developments on an important scale, when the size of the whole of the undertakings is considered.

For smaller power developments where a single individual is anxious to reduce his power fuel bill, especially when the growing of timber for building becomes more popular, or those plantations which have already been put down come to maturity, the market for small low-head units at a small price will be very great. Though the amount of timber required on the average farm is not very great, there is the annual demand for power for milling mealies and for grinding or cutting up cattle food, of which an increasing amount is required yearly as the fattening of cattle for export becomes more popular and more of a necessity for the farmer.

With petrol at 25s. 4d. an 8-gallon case, and paraffin at 16s., it is obvious that other sources of power must be looked for, even apart from crude oil, which up to the present is very little used, though gradually becoming more popular.

The larger municipalities are making an effort now to popularise the use of energy for domestic purposes by reducing their power rates, and those centres that are thinking of electricity will soon be turning their minds to Diesel engine sets, just as the prairie provinces of Canada did in 1910.

In the electrical market of Southern Rhodesia there is much spade work to be done, but the engineer into whose hand such work is given should have sound experience of general-purpose plants, and be fully aware also of the costs and working of various power-consuming machines including farm plant.

It is sincerely to be hoped that Great Britain will not enter the market too late; that is, when the way has been paved for American and Continental ideas and standards.

Road Trenching.

A Useful Stretcher for Electric Cables.

By J.T.T.

THE old-fashioned means of holding up the sides of deep road trenches has had its day. Stretchers of metal of "bottle-jack" form are now commonly used, but of all those that the writer has seen he considers that shown in the adjacent sketch to be most satisfactory in every way.

In fig. 1, A is a *rustless* steel tube, with a ¼-in. wall, ground up and case-hardened as far as the line B. These tubes can be made for contractors' use, of all necessary lengths and according to the widths of the trenches to be made; they are comparatively inexpensive. C is a gunmetal nut, having four threads per inch, mating with the screw D and having a free fit with the tube A. E are holes for a "tommy" bar, provided for adjusting the nut C, and thereby altering the overall length of the stretcher. F is a steel flange, fixed to, or integral with, the screw, having shart spikes G that penetrate the wood battens H H and prevent turning when nut C is adjusted. Exposed as such accessories are to corrosion, it is advisable that the screws D should be made (as are the tubes) of non-corrodible steel. The essential features of the device are (1) the handy variableness of the length of the tubes. (2) The hardening of the tube up to the line B on which the nut C rotates, and the use of rustless tubes. (3) The shortness and non-liability to damage from corrosion of the screw D, the metal being non-corrodible. (4) The spiked flange F.

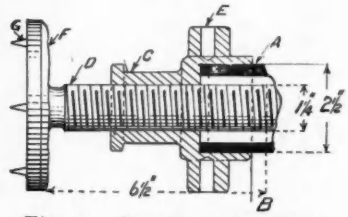


Fig. 1.—Details of One End of Fitting.

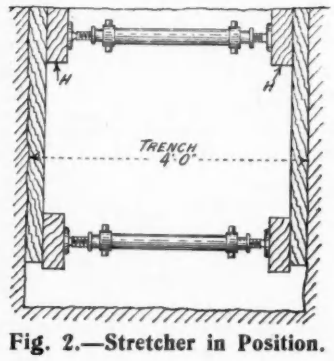


Fig. 2.—Stretcher in Position.

Fig. 2 represents the application of the device to the holding up of the sides of a deep trench. Both ends of the stretcher are adjustable. To set a stretcher, choose the longest tube applicable, turn at the screws from the nuts, set the stretcher where needed, and tighten up.

Industrial Research Report.

The report for the year 1929-30 of the Department of Scientific and Industrial Research (H.M. Stationery Office, price 3s. 6d. net), shows a total expenditure for the year of £536,746, as compared with £485,450 for the preceding year. It outlines, *inter alia*, the work done at the National Physical Laboratory, by the Fuel Research Board, and in connection with electro-deposition, radio, and other electrical and allied researches.

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures.

Record Attendances at the Fair.

Official records of the number of visitors to the London and Birmingham Sections of the British Industries Fair indicate that previous years' figures were considerably improved upon. Nearly 105,000 home buyers and about 1,900 overseas buyers visited the Birmingham section as compared with a combined total of 96,000 in 1930, and the interest of the general public was greater this year. The Olympia and White City sections reported the attendance of 167,000 home buyers and about 4,900 overseas buyers, as compared with a total of 155,000 last year. Business is reported to have been generally satisfactory. It is proposed further to extend the Castle Bromwich buildings for the 1932 Fair by the addition of 2½ acres to the permanent buildings.

Business in the Electrical Section at Birmingham was generally satisfactory. Representatives of leading firms stated that trade was distinctly better than they anticipated, and that many new accounts had been opened.

Mr. T. R. Martin (chairman of the Electrical Advisory Committee), informs us that he feels justified in saying that the number of visitors interested in electrical equipment and accessories was larger than at any previous Fair at Birmingham and most traders appear to be satisfied. The Electrical Section will require a good share of the additions that are to be made to the Fair buildings.

Electrical Contractors and Municipalities.

In the course of a speech at the annual dinner last week of the Sheffield branch of the Electrical Contractors' Association, Mr. H. J. Dean, chairman, said that the most rapid developments in domestic supply had taken place where the authorities had worked with the contractors instead of against them. It was little short of monstrous that in these days of widespread unemployment private traders and ratepayers should have to compete with a municipal authority that was so far forgetful of its responsibilities as to use foreign material on installation work. While they agreed that the hiring of expensive apparatus and of lighting installations in working-class dwellings were matters well within the province of the supply authorities, they maintained that the actual installation work should be in the hands of the contractors.

Tariff Application by Australian Lamp Makers.

The British General Electric Co., Ltd., the Australian General Electric Co., Ltd., and Philips Lamps (Australasia), Ltd., are applying to the Commonwealth Tariff Board for the imposition of a heavier duty on incandescent filament lamps. The existing duty is 1s. per lb. representing about 1½d. per lamp; the applicants ask for duties ranging from 9d. per lamp for lamps not exceeding 8 W up to 2s. per lamp, plus one-fifth of a penny per watt, for lamps of more than 65 W. The companies are interested in the new Australian lamp factory which is expected to commence production in April; they undertake that the prices to consumers will not be increased if the duties are imposed.

The Customs Department has already announced that parts of electric lamps, such as bulbs, caps, rods, filament wire, &c., will be admitted free if of British manufacture, while the duty on foreign products will be 10 per cent. This decision is a result of the establishment of the above-mentioned factory which, at first, will be principally an assembling centre.

Swiss Electrical Exports.

Despite the world trade depression Swiss electrical engineering concerns enjoyed an increased export trade during the past year, a total of £3,574,200 being recorded, an increase of £241,800 over 1929. Some details are given below:—

	1929. £	1930. £
Dynamos and motors	1,504,000	1,496,000
Control apparatus and instruments	1,464,000	1,576,000
Incandescent lamps	164,000	164,000
Electric locomotives	24,000	104,000
Telegraph and telegraph apparatus	56,000	80,000
Electric cables	80,000	72,000
Electrodes and carbons	4,400	34,200
Accumulators	24,000	28,000
Insulators	12,000	20,000
Totals ...	£3,332,400	£3,574,200

As will be seen, an increase took place in all the different branches except electrical machinery and cables. France and Spain were the best markets for dynamos and motors; France, Argentina, Holland, and Spain for control apparatus; Holland for electric lamps; Spain and Argentina for electric locomotives; Greece for telephone and telegraph apparatus; Great Britain and Belgium for cables; Russia for electrodes; Italy and Argentina for accumulators; and Spain, Jugo-Slavia and the United States for insulators.

Malayan Electrical Imports.

Imports of electrical goods into Malaya during the first nine months of 1930 had a total value of £489,284, as against £629,172 in the corresponding period of 1929.

South African Trade Interviews.

Mr. J. W. Brigden, H.M. Trade Commissioner at Johannesburg, is now in this country on an official visit. He will be available at the offices of the Department of Overseas Trade during the period March 16th to 24th to interview manufacturers and merchants interested in the export of British goods to South Africa. He will also visit a number of industrial centres in the provinces. Firms desiring interviews with Mr. Brigden in London, or information regarding his arrangements to visit provincial centres, should apply to the Comptroller-General of the Department, 35, Old Queen Street, S.W.1, quoting Reference No. 1452/31.

Trade with Denmark.

A confidential memorandum containing information as to the methods of trading and terms of payment prevailing in relation to business with Denmark, together with notes on the general features of the market, prepared by the Commercial Secretary to the British Legation at Copenhagen, has been received and issued by the Department of Overseas Trade to firms whose names are on its Special Register. British firms who desire to obtain a copy of the memorandum should apply to the Department, quoting Reference No. C.X.3463.

Apparatus Approval in Belgium.

For several years past the Comité Electrotechnique Belge, of Brussels, has had in operation a plan whereby makers of electric wires and cables conforming to the Comité's standards have been able to brand them with the mark "C.E.B." The Comité has lately decided to extend the marking scheme to such low-pressure electrical apparatus as is submitted to it for test and approval. It is pointed out that the use of apparatus bearing the mark "C.E.B." in electric lighting and power installations will facilitate its acceptance by electricity supply undertakings.

Forthcoming Continental Fairs.

This year's Swiss Samples Fair is to be held in Bâle from April 11th to 21st. The period of the Foire de Paris is from May 9th to 25th. Both of these fairs are to include electrical sections.

A Cooker's Good Record.

One of the items which appeared on the stand of the Credenda Conduits Co., Ltd., at the B.I.F., Birmingham, was a "Creda" cooker, which has been in use in a cottage in the area of the Tamworth District Electric Supply Co., Ltd., for the past five years. The manager of the supply company says that in each of the past three years the cooker has won their annual "Clean Cooker Competition." Its principal virtue from the supply company's point of view, however, lies in the fact that since its installation it has cost nothing for maintenance.

A Shunting Locomotive Battery.

New Distributors of Edison Storage Batteries, Ltd., inform us that they supplied the "Edison" battery for the "Greenbat" shunting locomotive described in our issue of February 20th (p. 355).

A Chelmsford Meter Matter.

At a recent meeting of the Chelmsford Corporation, Councillor Taylor reported that meters made in Bavaria were being installed in Chelmsford by the Electric Supply Corporation, Ltd., in connection with the change of system of electricity supply, and it was decided that a letter of protest should be forwarded to the Electric Supply Corporation asking it, if any further meters were installed, to provide meters of British make.

Price Reduction.

The General Electric Co., Ltd., announces that it has reduced the price of the "Osram" type D.A. 60 valve which is suitable for use in the output stage of public-address and talking picture amplifiers of moderate size.

D

How Lamps are Made.

The General Electric Co., Ltd., has prepared for the guidance of visitors to its Hammersmith and Wembley lamp works an ingenious brochure which illustrates, step by step, the processes by which "Pearl Osram" lamps are made. Commencing with the central glass stem, by overlaying successive pages the lamp is gradually built up until the finished product is reached in twelve stages. Upon each page is an illustration of the machine which carries out the particular process dealt with.

A Floodlighted Pagoda in Burma.

Modern Treatment of an Ancient Building.

The Shwe-Dagon pagoda, Rangoon, one of the most famous pagodas in the world, has recently been the subject of a scheme of floodlighting. A night photograph of the pagoda is reproduced herewith; it shows the shrine under conditions without parallel in its presumed two thousand years of existence. All its salient features are revealed and are visible from a considerable distance, although only nine floodlights are used, each of these being equipped with a 500-watt Osram gasfilled lamp.

Proposed New Municipal Showrooms.

At a recent meeting of the Brighton Town Council it was decided to erect new showrooms and offices at the corner of Castle Square and the Steyne at a cost of £43,000.

Plans for new showroom buildings in Bridge Street have also been prepared by the Electricity Department of the St. Helens (Lancs.) Corporation.

Electrical Commercial Travellers.

The sixth annual dinner of the Electrical Trades Commercial Travellers' Association took place at the Connaught Rooms on February 27th. The chairman of the Association, Mr. F. C. Chown, presided, and the principal speaker was Sir Felix J. C. Pole, president of the Association. Following the loyal toast, the chairman proposed the president's health, mentioning that one of the Association's objects was to find employment for its members. He urged all electrical firms who required travellers to apply to the Association for its assistance. In the course of his response to the toast, Sir Felix Pole congratulated the Association upon its rapid growth, which was a testimony to its value. It was obvious from the appearance of the members that the electrical industry was a prosperous one and this was confirmed by the Electricity Commissioners' latest report. It was apparent that the electrical industry was progressing at a time when most industries were in difficulty. This was a good augury of what might be expected when trade revived. Those who had the onerous task of selling deserved well of their employers and the community. Upon a recent visit to the Near East he had been impressed by the unfair competition which British manufacturers had to face. How could a free trade country successfully meet such conditions? The Government should not merely urge us to "buy British," it should make us do it. Then if the clouds did not disappear they would be considerably lightened. As one method of improving the situation, Sir Felix maintained that supply authorities should extend their cables regardless of whether there would be an immediate return or not; and they should not make high charges for connection. The toast of "The Association and its Charities" was proposed by Mr. N. V. Everton, who said that although there existed firms' benevolent schemes and the E.T.B.I., there was still a necessity for the Association to have a benevolent fund for its less fortunate members and their dependants. Mr. E. A. Joyce replied, and mentioned in his speech that during the last three years the Association from its very small revenue had contributed £184 to charities. The health of the guests was proposed by Mr. L. Ashman, and Mr. J. B. Conly, J.P., replied. Mr. R. W. Whitley toasted "The Chairman and Officers," and Mr. Chown made a brief response. During the evening an excellent variety entertainment was provided.

The Sheffield Mission's Report.

The Stationery Office has just issued the report of the Sheffield Industrial Mission which visited South America in the latter half of last year (price 1s. 3d. net). Although the Mission's activities were directed towards the increasing of the trade in steel products, much of the report is of general interest to those who conduct business with South American countries. The reasons why Sheffield has lost trade in these countries are generally identical with those accounting for the loss of trade as a whole—failure to study the markets thoroughly; the effects of the war; the lower prices of competitors' goods; and the better service and credit terms offered by competitors. It follows that the Mission's recommendations are very similar to those of the D'Abernon Mission. They relate to the formation of selling organisations, frequent and prolonged visits of principals to the market, the study of tariffs the extension of credit, the production of suitable catalogues and kindred matters. It is noted that several British firms have recently opened branch factories in partnership with established merchant houses—British or South American—with promising results. In one case an existing Brazilian factory was purchased. The report is of value as confirmation of much that has already been said and should serve to arouse a keener appreciation of the factors which enter into South American trade.

"Exide" Battery Works Extensions.

Important additions have recently been made to the works of the Chloride Electrical Storage Co., Ltd., at Clifton Junction, near Manchester. The "Exide" battery factory is claimed to be the largest battery-making plant in the British Empire, and the new departments now completed are of much practical service to this large organisation. New laboratories and offices have been built for the technical staff engaged on research and experimental work, and to accommodate the medical and dental clinics. The new technical building containing them occupies a central site in the works, and stands about 30 ft. high, with a length of 75 ft. and a width of 25 ft. It has a flat concrete roof with two north lights to give even lighting in the laboratories which occupy the upper floor. The effect of this can be gauged from the accompanying picture. The main entrance at the front leads into a vestibule with doors opening on the left into the hall of the medical and dental clinics, and on the right to the offices of the inspection and transport departments.

In the medical laboratory blood examinations are carried out; the information obtained in this way enables the hygienic side of all processes to be accurately controlled. This and other preventive measures have resulted in a clean sheet as regards lead poisoning at the works during the past three years. The dental surgery is fitted with the most up-to-date electrical equipment.

The upper floor is divided into two sections—the analytical laboratory and the research laboratory. Between these are the offices, balance rooms, and chemical store. The analytical laboratory is concerned with the chemical testing of raw materials used in the works, while the research laboratory is engaged on important original work in connection with oxides of lead, paste mixings, and general chemical and physical work pertaining to the manufacture of batteries.

The New Chloride Research Laboratory.

For Sale.

Liverpool Electric Supply Department invites tenders for the purchase and removal of generating plant at Marsh Lane station, Bootle.

Messrs. Henry Butcher & Co. will sell by auction on March 18th, at 9, Brunswick Place, City Road, N., machine tools, plant and stock of a manufacturing electrical engineer.

(See our advertisement pages to-day.)

Recent Contracts.

The Lancashire Dynamo & Motor Co., Ltd., has just obtained an order for 900 electric motors and control gear from the Whitehall Securities Corporation, Ltd., in connection with the change-over of the electricity supply in the city of Athens. The order was obtained against the keenest British and Continental competition.

Messrs. Siemens Bros. & Co., Ltd., have received an order from the General Post Office for a further 25,000 hand-microphone telephones. Orders for 50,000 had already been placed with the company.

An Elevated Sub-station.

The new building which is being erected in Kensington for Messrs. Derry & Toms, Ltd., will provide a substantial electrical load and for this reason will have its own sub-station. Sub-stations of this kind are usually concealed in basements but this one goes to the other extreme, being upon the roof. Messrs. Crompton Parkinson, Ltd., are providing two 700 kVA transformers, a four-panel e.h.p. and a four-panel l.p. truck type switchboards for the sub-station, and in the accompanying illustration one of the transformers is seen on its way to the roof. The principal contractors for the electrical work are Messrs. Grierson, Ltd. The decision to place the sub-station on the roof was made by Mr. A. G. Freeborn, chief engineer to Messrs. Barker's, who own Derry & Toms, Ltd.

A Transformer for a Roof Sub-station.

Exhibition at Torquay.

Organised by Mr. G. H. Hollyer, borough electrical engineer and manager, an exhibition of domestic electrical appliances was opened at the Town Hall, Torquay, on February 23rd. The opening ceremony was performed by the chairman of the Corporation Electricity Committee, who said that this was the first electrical exhibition that had been held in Torquay. Within the borough they had an area of 220 sq. miles in which they supplied energy, but if they took in the extended area they supplied something like 400 sq. miles. The Corporation already hired out cookers, water heaters, &c., and now had under review a hire-purchase wiring scheme, which would shortly be introduced. At the present time they were supplying 10,000 consumers and hiring out 3,700 domestic appliances. During the past five years they had increased the output by 400 per cent., and by the end of March they would be supplying 20,000,000 kWh a year. They were expecting to get powers for an extended area, which Torquay would supply by overhead lines, and when these lines had been erected an area bounded by Moretonhampstead, Kingsbridge, Torquay, and Ivybridge would be supplied from the Newton Abbot power station. Meanwhile, additional plant was being installed at that station. There were cookery demonstrations in connection with the exhibition, and the Torquay branch of the Electrical Association for Women was represented by a stall in charge of Mrs. Hollyer, from which electrical literature was distributed.

Book Notices.

"Southampton Docks," compiled by H. N. Appleby. Pp. xxxiii+168. London: Southern Railway Co.—Full details of the general, foreign, and Colonial trade of the port of Southampton are given in this excellently-produced publication. The docks themselves are described in an interesting manner, with numerous illustrations, and particulars are given of the facilities offered for the handling of different types of cargo. Sections are included dealing with tonnage rates and rents, conditions, and charges for the use of docks, import rates, and by-laws of the docks.

"Sell's Directory of Registered Telegraphic Addresses, with Telephone Numbers and Classified Trades, 1931." London: Business Dictionaries, Ltd. Price 45s.—This is the 46th edition of this well-known directory, which is not only a guide to the registered telegraphic addresses, but of considerable value as a general directory. An interesting feature of the present edition is a Newspaper Press section giving particulars of the daily, weekly, and monthly periodicals of Great Britain and Ireland and principal papers throughout the world. The sections in previous editions are retained, while there is a special section of American exporters, merchants, &c., who are interested in the development of Anglo-American trade.

To mark the occasion of the opening of its new head office building, Lloyds Bank, Ltd., has produced a remarkable volume entitled "'Twixt Lombard Street and Cornhill." This contains a brief history of the City of London, with many illustrations in colour and illuminated borders, and an account of the growth of Lloyds, all of which has been designed, written and illustrated by the Bank's staff.

"Let's Help: A Collection of Good Causes," by Sir Charles Bright, F.R.S.E. (198 pp.). London: George Routledge and Sons. Price 4s. 6d. net.—The author of this volume is well known to the electrical industry, and particularly to the submarine-cable world. He now devotes much time to social work, and "Let's Help" is one result of this. The book contains particulars of about 50 British organisations of many kinds engaged in the betterment or assistance of humanity.

"Hydraulics for Engineers," by R. W. Angus. Pp. xii+304; figs. 161. London: Sir Isaac Pitman & Sons, Ltd. Price 12s. 6d.

"Switchgear Practice," by H. E. Poole. Pp. xi+227; figs. 100. London: Chapman & Hall. Price 15s. net.

"Public Works Facilities Act, 1930," by F. N. Keen, LL.B., and H. R. Askew, B.Sc. Eng., A.M.I.C.E. London: Stevens and Sons, Ltd. Price 10s. net.

The Business Efficiency Exhibition.

This annual exhibition is to be held at the White City in London from March 17th to 26th.

Social Events.

The ninth annual meeting and supper of the Metropolitan-Vickers Electrical Co., Ltd., Long Service Association was held at the Trafford Park staff canteen on February 23rd. Sir Philip A. M. Nash, the president of the Association, was unfortunately unable to take the chair owing to illness, and his place was taken by Mr. G. E. Bailey. Sir Felix Pole, chairman of Associated Electrical Industries, Ltd., Mr. Lusk, vice-chairman of A.E.I., Ltd., and several directors and officials of the British Thomson-Houston Co. were present as guests, also Mr. Philip Lang, former managing director of the British Westinghouse Company. The supper, consisting of Christmas fare, began at 6 o'clock and at 7 o'clock Mr. Walmsley, chairman of the Association, opened the business meeting. It was shown that the membership had grown from 302 in 1923 to 1,142, 34 of whom were women, at the end of 1930. The increase in membership during the past year amounted to 122. The Association had lost 14 members by death during 1930. After the meeting a concert was given by the M.-V. Male Voice Choir and Orchestra, and Mr. G. E. Bailey and Sir Felix Pole addressed the members. During the evening, Mr. John Cameron, known as "Old John of the South Gate," was presented with a framed photograph and a gold watch on his retirement, after many years of service. A cigarette box was given to Mr. Philip Lang as a token of the Association's esteem.

The first annual ball of the Tees-side Section of the Electrical Trades Benevolent Institution was held in Middlesbrough on February 27th. The president of the section (Alderman S. Sadler) was unable to be present on account of ill-health, but among those present were Mr. R. H. Scotson (chairman), Messrs. H. Sanderson, P. Graham, D. B. Hogg, A. Mackinnon, W. A. Gallon, J. W. Morrish, H. Towers, A. S. Richards, W. Upton, A. Parkin, R. N. Crawford (hon. secretary), and G. D. W. Middleton (assistant hon. secretary). The Mayoress of Middlesbrough (Councillor Dr. Minnie Levick) was present, and made a happy speech, in which she commended the objects of the dance.

The annual dinner and smoking concert of Southport Corporation Electricity Department Welfare Club was held at Woodhead's Café, Southport, on February 24th, Mr. E. Moxon (president of the club) presiding. Councillor Hardman (chairman of the Electricity Committee), in a brief speech, said it was to a great extent due to the team spirit existing that the department was so successful. The G.E.C. Troupe was responsible for the major portion of a well-arranged and varied programme.

New Catalogues and Lists.

Baxter & Caunter, Ltd., 221, Tottenham Court Road, London, W.1.—The March issue of the company's electrical accessories list.

The British Thomson-Houston Co., Ltd., Rugby.—A quantity of literature dealing with isolators, squirrel cage and slip-ring induction motors, d.c. motors and generators, a.c. oil-break switch starters and ironclad draw-out switchgear.

Archibald Kenrick & Sons, Ltd., 65, Newman Street, Oxford Street, London, W.1.—A brochure illustrating and describing a number of "Kenrick" irons, fires and cookers.

The Normand Electrical Co., Ltd., 3, North Side, Clapham Common, S.W.4.—Leaflet No. 231, giving particulars of "Neco" fractional-h.p. low-speed geared motors and a list of some of the numerous uses to which they are put.

The Marconiphone Co., Ltd., 210-212, Tottenham Court Road, London, W.1.—Part VII of Captain Eckersley's articles on "Radio Service for the Dealer." Also the March issue of "Radio."

The D.P. Battery Co., Ltd., Bakewell.—An interesting brochure on "Katholite" emergency lighting equipment.

Improved Gears, Ltd., 23, Queen Anne's Gate, Westminster, London, S.W.1.—An illustrated booklet describing the "Wilson" self-changing gear.

Calendar blotters for March have been received from:—Mavor & Coulson, Ltd., 47, Broad Street, Glasgow, and Pope's Electric Lamp Co., Ltd., 5, Arthur Street, London, W.C.2.

Callender's Cable and Construction Co., Ltd., Hamilton House, Victoria Embankment, London, E.C.4.—An interesting illustrated booklet (No. 46) on the subject of modern church lighting by means of the "Kalibond" wiring system.

Elliott Brothers (London), Ltd., Century Works, Lewisham, London, S.E.13.—A number of catalogue sheets giving particulars of moving-coil and moving-iron switchboard instruments, improved-pattern recording instruments, &c.

The Edison Swan Electric Co., Ltd., 123-5, Queen Victoria Street, London, E.C.4.—Folder H.C. 626, relating to "Ediswan" bowl fires.

Marelli & Co., Ltd., 19 and 20, Garlick Hill, Queen Victoria Street, London, E.C.4.—Leaflet PIV 25, giving particulars of "Marelli" small domestic electrically-driven pumping sets.

Newtons of Taunton, 6, Grape Street, Shaftesbury Avenue, London, W.C.2.—An illustrated catalogue of "Newton" garage electrical equipment.

G. P. Cosway, Ltd., Princes Street, Nuneaton.—A catalogue illustrating various types of link disconnecting boxes, feeder pillars, service boxes, manhole frames and covers, pole mounting boxes, cartridge fuses, &c.

Ferranti, Ltd., Hollinwood, Lancs.—List Wa 505 giving full details of the type AF8 audio frequency transformers.

The Ever-Ready Co. (Great Britain), Ltd., Hercules Place, Holloway, London, N.7.—A chart showing the correct "Ever-Ready" battery for use in various portable radio receivers.

Brookhirst Switchgear, Ltd., Northgate Works, Chester.—A leaflet relating to "Brookhirst" synchronous motor control gear.

Alfred Ingram & Co., 17, Victoria Street, London, S.W.1.—A brochure covering "Raco" electrodes and welding wires for both electric and acetylene welding.

The Electric Resistance Furnace Co., Ltd., 17, Victoria Street, London, S.W.1.—The February issue of the "Resistance Furnace" containing an article on the "Efco" type "S" high-temperature furnaces.

The A.E.G. Electric Co., Ltd., 131, Victoria Street, London, S.W.1.—Publication X11021E, illustrating and describing the company's night-load (time-switch) meters.

Brook Motors, Ltd., Empress Works, Huddersfield.—Pamphlet No. 296, containing illustrations and a specification of the company's "RX" two- and three-phase squirrel-cage motors.

British Electric Welding Machines, Ltd., Castle Mills, Dudley, Worcs.—A first catalogue illustrating and describing "Stronghold" spot, butt and seam welding machines and rivet and pipe heaters.

Trade Announcements.

Korting & Mathiesen Electrical, Ltd., 711 and 715, Fulham Road, S.W.6, informs us that it has acquired the electrical plant department of Messrs. Eck & Brook, Ltd. (in voluntary liquidation), including the products of the Garbe Lahmeyer works. The company has sent us a stock list of "Dew" motors and dynamos.

The Coq Switchgear Co. has removed its offices from Salford to temporary offices at 26, Manor Road, Southport.

New Italian Companies.

Among the concerns recently formed in Italy are the Società Elettrotermica Hellwerk Torinese, Turin, capital 250,000 lire; La Società Elettrica di Capolignie, Capolignie, 500,000 lire; La Società Industriale Elettro-Meccanica Lombard, Brescia, 100,000 lire; and La Società Elettrica Frentano, Lanciano, 500,000 lire.

Bankruptcy Proceedings.

F. A. Coulson, wireless factor, &c., 273, Archway Road, Highgate, N.—Receiving order made February 24th, on a creditor's petition. First meeting, March 9th, and public examination, May 6th, both at Bankruptcy Buildings, Carey Street, W.C.2.

F. Moore (F. Moore & Sons), electrical contractor, 34, Victoria Gardens, Horsforth.—Receiving order made February 23rd, on debtor's own petition.

H. Sandell, electrical engineer, 1, Sandpit Lane, St. Albans.—Receiving order made February 23rd, on debtor's own petition.

H. G. Price, general and electrical engineer, 18-20, Canal Street, Nottingham.—First meeting, March 6th, at 22, Regent Street, Park Row, Nottingham. Public examination, April 16th, at the County Court House, St. Peter's Gate, Nottingham.

S. Gillett (G.E.T. Electrical Supplies Co.), electrical goods dealer, Lansdowne, Offerton Lane, nr. Stockport.—First meeting, March 6th, at the Official Receiver's Office, Byrom Street, Manchester. Public examination, March 27th, at the Court House, Vernon Street, Stockport.

S. Nicholls (Electrical Wireless & Gramophone Supply Co.), electrical engineer, 151, Marlowes, Hemel Hempstead.—Trustee, Mr. B. T. Crew, 4, Dove Court, Old Jewry, E.C. Appointed February 23rd.

W. H. Thornton, electrical and wireless engineer, 25, Bridge Street, Burnley.—Supplemental dividend of 11½d. in the £, payable March 9th at the Official Receiver's Office, District Bank Chambers, Blackburn.

H. Chadwick, radio salesman, 15, Refuge Street, Shaw.—Receiving order made February 20th on debtor's own petition. First meeting, March 9th, at the Official Receiver's Offices, Byrom Street, Manchester. Public examination, April 21st, at the Court House, Church Lane, Oldham.

J. S. Hicklin, electrical engineer, &c., 191, High Street, Bloxwich.—Receiving order made February 19th on debtor's own petition. First meeting, March 9th, at 191, Corporation Street, Birmingham. Public examination, March 19th, at the Court House, Lichfield Street, Walsall.

E. C. G. Hefti, electrician, 10, Dean Road, Scarborough.—First meeting, March 6th at the Official Receiver's Office, 48, Westborough, Scarborough. Public examination, March 10th at the Court House, Castle Road, Scarborough.

S. E. Richards and A. K. Neilson (Richards & Neilson), wireless and electrical engineers, 182, Tulse Hill, S.W.—Application for discharge to be heard on March 17th at Bankruptcy Buildings, Carey Street, W.C.2.

E. Ball, electrical contractor, Old Hall Street, Middleton.—First and final dividend of 3s. 7½d. in the £, payable March 4th at the Official Receiver's offices, Byrom Street, Manchester.

Company Liquidations.

Mold Accumulators, Ltd., Grosvenor Street, Mold.—At the statutory meeting of the creditors of the above, held recently at Chester, the statement of affairs submitted showed liabilities of £1,952 and net assets of £745, leaving a deficiency of £1,207. The company was registered in 1926, with a nominal capital of £1,000. Of that amount 368 ordinary and 350 preference shares of £1 each had been issued, making the deficiency as regarded the contributories £1,902. Net losses were incurred in 1928-29 and 1929-30, totalling £633. The voluntary liquidation of the company was confirmed, with Mr. J. Davis as liquidator, together with a committee. The following are creditors:—

	£		£
Mold U.D.C....	44	J. Lucas, Ltd.	47
Pifco, Ltd.	37	Pollard & Smith	168
H. Hollingdrake & Co., Ltd.	77	Ensign, Ltd.	98
		B.N.B. Wireless	100

R. B. Heckie & Co., Ltd., Glasgow.—Winding up voluntarily. Liquidators, Mr. J. Bowes, junr., 125, Buchanan Street, Glasgow, and Mr. D. S. Hepburn, 19, St. Vincent Place, Glasgow. At a meeting of creditors held on February 19th a statement of affairs was submitted showing unsecured creditors' claims totalling £1,411 and net assets of £630, leaving a deficiency of £781. A committee of inspection was appointed to act with the liquidators.

Newbridge-on-Wye Electricity, Ltd.—Meeting at Vicarage Room, Newbridge-on-Wye, Radnor, March 24th, to receive an account of the winding up of the company.

Cook's Wireless Co., Ltd.—Particulars of claims by March 17th to the liquidator, Mr. L. Ensor, 30, Museum Street, Ipswich.

Dissolution of Partnership.

Quadrant Electric Stores, electrical and wireless engineers, 61, Station Road, Harrow.—Mr. D. J. Evershed and Mr. A. G. Jones have dissolved partnership. Mr. Evershed will attend to debts and carry on the business.

Winding-up Petition.

Electradio Co., Ltd.—Winding-up petition presented to the High Court by Mr. F. H. Sidwell and Messrs. Talbot Ellis Jack & Co. To be heard in London on March 9th.

Private Arrangements.

T. W. Jefferson, 62, Park Road South, Birkenhead, electrical contractor.—At a recent meeting of creditors a statement of affairs submitted showed liabilities of £2,095, of which £1,545 was due to the trade. The net assets were £524, leaving a deficiency of £1,571. The debtor had traded on his own account since 1926, prior to which he was interested in a limited company which went into liquidation some time ago. The debtor opened in business in Birkenhead, and had branches in Wallasey, Hoylake, and Preston. Losses had been sustained with the exception of one year. Mr. K. G. Lyon, 19, Castle Street, Liverpool, and Mr. R. Lee, were appointed joint trustees with a committee. The following are creditors:—

	£		£
Baxendale & Co., Ltd. ...	183	Hughes & Jones	92
British Thomson-Houston Co., Ltd.	47	Commissioners of Inland Revenue	614
Clegg Highcock	75	Rowe Bros. & Co., Ltd.	45
Dodd and Oulton	57	Philips Lamps, Ltd. ...	36

S. G. MILLER, trading as the Millbro Radio Electrical Co., 44, Coldharbour Road, Redland, Bristol, radio and electrical engineer.—The creditors in this matter met on February 27th, at the offices of Messrs. E. T. Collins & Son, 28, Baldwin Street, Bristol. The statement of affairs showed liabilities of £372 and a deficiency of £199. The debtor commenced business in November, 1929, with a capital of £50, after serving for seven years in the Post Office Engineering Department. The accountants were of the opinion that there had been a loss on trading from the commencement, and the debtor attributed his position to the fact that the turnover was not sufficient. No offer of a composition was made, and it was resolved that a deed of assignment should be executed to Mr. Arthur Collins as trustee. A committee of inspection was also appointed, consisting of Messrs. R. A. Webber, A. W. Moir, and Corfield and Cripwell. The following are creditors :—

	£		£
Fred Burris & Sons, Ltd.	43	Webber, R. A.	40
Clark & Moir, Ltd.... ...	68	Symonds, F.	23

Deed of Assignment.

A. HOLMES, J. H. HOLMES, E. HOLMES, and S. HOLMES, trading as J. H. Holmes & Co., &c.—A third and final dividend of 1s. 1¼d. in the £ has been declared by the trustees, Messrs. J. Miller & J. Taylor, Gibb Chambers, Westgate Road, Newcastle-upon-Tyne.

Reduction of Capital.

SOUTH-WEST ELECTRICITY, LTD.—A petition for the reduction of the capital from £4,000 to £1,176 5s. To be heard in London on March 9th.

New Refrigerator Showrooms.

On Tuesday last a new branch was inaugurated at 223-225, Deansgate, Manchester, by MARCO REFRIGERATORS, LTD. Councillor Lt.-Col. G. Westcott, O.B.E., performed the opening ceremony and a large party made a tour of the well-appointed showrooms, afterwards partaking of lunch at the Midland Hotel, Manchester, at which Sir Sven W. Hansen, chairman of the company, presided.

Prices of Materials.

The following prices are only general, and they may vary according to quantities and other circumstances :—

	CHEMICALS, &c.	Price March 3rd.	Fortnight's inc. or dec.
a	Acid, Oxalic... ... ... per lb.	5½d.	...
a	Ammoniac, Sal ... ... per ton.	£60	...
a	Ammonia, Muriate (large crystal) ,,	£52	...
a	Bisulphide of Carbon ... ... ,,	...	...
a	Borax ... ... ,,	£17	...
a	Copper Sulphate ... ... ,,	£25 10s.	...
a	Potash, Chlorate ... ... per lb.	3d. to 4d.	...
a	,, Perchlorate ... ... ,,	5½d.	...
a	Shellac ... ... per cwt.	£13 10s.	...
a	Sulphur, Commercial ... ... ,,	£11	...
a	,, Roll ... ... ,,	£11	...
a	Soda, Chlorate ... ... per lb.	3d.	...
a	,, Crystals ... ... per ton.	£5 to £5 5s.	...
a	Sodium Bichromate, casks ... per lb.	3½d.	...
	METALS, &c.		
b	Aluminium, Ingots ... ... per ton.	£85 to £90	...
b	,, Wire ... ... per lb.	1/1 to 1/9	...
b	,, Sheet	1/1 to 2/9	...
b	Babbitts Metal and Anti-friction Metals—		
	Grade I ... ... per ton net.	£120	£5 inc.
	Grade II ... ... ,, ,,	£86	£2 inc.
	Grade III ... ... ,, ,,	£52	£1 inc.
c	Brass (rolled metal 2" to 12" basis) per lb.	7¾d.	½d. inc.
c	,, Tubes (Solid drawn) ... ,,	9¾d. to 10d.	...
c	,, Wire, basis ... ... ,,	8¾d.	½d. inc.
c	Copper Tubes (solid drawn) ... ,,	11d.	...
g	,, Bars (best selected) ... per ton.	£77	}
g	,, Sheet ... ... ,,	£77	£2 inc.
g	,, Rod ... ... ,,	£77	}
d	,, (Electrolytic) Bars ... ,,	£50 12s. 6d.	15s. inc.
d	,, ,, Sheets... ... ... ,,	£143 10s.	...
d	,, ,, Wire Rods ... ,,	£60 12s. 6d.	15s. inc.
d	,, ,, H.C. Wire ... per lb.	7½d.	½d. inc.
f	Ebonite Rod... ... ... ,,	2/3 to 2/6	...
f	,, Sheet ... ... ,,	2/3 to 2/6	...
n	German Silver Wire ... ... ,,	2/1	...
h	Gutta-percha, fine... ... ... ,,	nom.	...
h	India-rubber, Para fine ... ... ,,	4¾d.	...
i	Iron, Pig (Cleveland No. 3.) ... per ton.	58/6	...
l	,, Wire, galve. No. 8, P.O. qual. ,,	£20	...
g	Lead, English pig... ... ... ,,	£15 10s.	15s. inc.
g	Mercury ... ... per bot.	£22 7s. 6d. to £22 10s.	...
e	Mica (in original cases) small ... per lb.	6d. to 3/-	...
e	,, ,, medium ,,	4/- to 8/-	...
e	,, ,, large ... ,,	10/- to 20/- & up	...
p	Phosphor Bronze, plain castings ,,	1/1½d.	...
p	,, ,, drawn bars & rods ,,	1/0½d.	...
p	,, ,, rolled strip & sheet ,,	1/1d.	...
p	,, ,, wire ... ... ,,	1/1½d.	½d. inc.
o	Platinum ... ... per oz.	£6 17s. 6d.	...
d	Silicium Bronze Wire ... ... per lb.	9½d.	...
r	Steel, magnet, in bars ... ... ,,	7½d.	...
g	Tin, Block (English) ... ... per ton.	£124 to £125	£4 5s. to £4 15s. inc.
n	,, Wire, Nos. 1 to 16 ... ... per lb.	2/11d.	...

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd
n P. Ormineton & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

Lighting and Power Notes.

Aylesbury.—YEAR'S WORKING.—We have received from Mr. W. A. Turnbull, borough electrical engineer, a copy of the accounts of the Corporation Electricity Department for the year ended March 31st last. The total revenue amounted to £62,233, while the working expenses were £31,131. The gross profit totalled £31,102 to which was added revenue from other sources making a total of £32,916. After providing for interest on loans, sinking fund, income tax, &c., there was a net surplus of £8,476. During the year £32,736 was spent on capital account, bringing the total now spent on the undertaking to £258,440. Sales of electricity increased from 4,900,483 to 7,127,984 kWh and the maximum supply demanded from 2,350 to 2,460 kW.

Barking.—SWITCHGEAR FOR SUB-STATION.—The Urban District Council Electricity Committee is again inviting tenders for the supply of switchgear for Lodge Lane sub-station.

LOAN.—Application is being made for sanction to the borrowing of £1,700 required for supplying electricity to Messrs. J. J. Masters & Co., Ltd.

Bath.—LOAN.—The City Council has applied for sanction to a loan of £20,000 for mains and services for the next two years.

Bognor Regis.—ELECTRICITY ACCOUNTS.—The annual balance sheet of the Bognor Regis Gas and Electricity Co., Ltd., shows a profit of £17,212. The increased consumption accounted for a rise of £4,022 in the revenue.

Bolton.—ASSISTED WIRING.—The assisted wiring scheme put into operation by the Corporation Electricity Committee in 1929 has been amended, so as to provide for the payment of 10 per cent. as against 15 per cent. of the cost on signing the agreement, the remainder to be paid by equal quarterly payments not to exceed 20 as compared with the original 16.

Brighton.—NEW SUB-STATIONS.—The Corporation Electricity Committee is to apply for sanction for a loan of £10,000 for static sub-stations to be provided during the next three years. A new sub-station is to be erected at Portslade at a cost of £1,400.

MAINS EXTENSIONS.—Mains extensions are to be carried out at a cost of £1,870.

LOAN SANCTIONED.—Sanction has been received to a loan of £75,000 on account of the proposed new 15,000-kW turbo alternator set at Southwick works.

HIRE-PURCHASE SCHEME.—The Corporation Electricity Committee has approved a scheme for the hire-purchase of apparatus and wiring of power installations and has decided to apply for sanction to a loan of £2,000 for the purchase of electrical apparatus required.

Canvey Island.—ELECTRICITY SUPPLY INAUGURATED.—A system of public lighting by electricity was inaugurated on March 2nd. A private supply is also available. An 11,000-V cable has been constructed from the sub-station at South Benfleet, and two of three distributing stations are in operation.

Cheltenham.—EXTENSIONS.—The Corporation Electricity Committee has obtained sanction to the borrowing of £5,092 for electricity supply extensions to Bishops Cleeve and Woodmancote. A scheme has also been adopted for the extension of mains to supply Uckington and Arle villages at a cost of £3,826.

Continental.—FRANCE.—La Société des Grands Travaux de Marseille, of Marseilles, has recently secured a concession to establish hydro-electric stations at Pied-de-Borne and Chamborias, near Malens, Gard Department.

Darlington.—PROPOSED REDUCTION OF CHARGES.—The annual estimates of the Corporation Electricity Committee show an anticipated increase of revenue over last year of £3,600 and a surplus profit of £8,571. It is recommended that a reduction of five per cent. be made in the charges for electricity for the current quarter which would reduce the surplus profit to about £7,000. There is a reduction in the quantity of electricity sold for power purposes, but this is balanced by an increase in the sales of energy for lighting, heating, and traction purposes. Considerable extensions of the electricity mains are recommended.

Dumfries.—ELECTRICITY SCHEME.—A £209,695 electricity distribution scheme for the county has been adopted by the County Council. The Council is to erect mains and subsidiary distribution lines all over the county, and to assist in the wiring of houses and the provision of domestic apparatus. The Council is the first county authority in the country to become an authorised undertaker for its whole area. The main distribution lines will total 188 miles and the subsidiary lines 135 miles. Under the Grid scheme the Council will receive supplies in bulk at Gretna and Dumfries.

The Committee has already made arrangements for the surveys and other procedure precedent to inviting tenders for the constructional work, and five separate survey parties will commence in a few days. In view of the time limit it will be necessary for the constructional work to proceed in at least three areas simultaneously.

Exeter.—Electricity Tariffs.—Moving the adoption of the Electricity Committee's report at the February meeting of the City Council, which recommended a contribution of £2,000 from the profits of the electricity undertaking during the past year to the general rate fund, the chairman, Mr. A. E. Brock, said that electricity consumers might look in a few months for a reduction of the charges. He hoped that every connection in the future would be made on the new all-in tariff system, which was based on the assessments of the consumers' houses. Those who had taken advantage of this tariff had paid an average of only a little over 1½d. per kWh in addition to the deposit.

Finchley.—Street Lighting.—The Urban District Council has decided to light arterial roads by electricity at an estimated cost of £1,123.

Fleetwood.—A.C. Supplies Required.—The Fylde Ice Co. is converting its machinery from steam to electricity and the Urban District Council has decided to install three new rotary convertors and transformers at the works to enable it to give the required supply.

Hampton.—Pumping Plant.—The Metropolitan Water Board is to provide a 500-kW oil-engine-driven generator, to supply energy to three centrifugal pumps, at Hampton works at a cost of £20,000.

Hebden Bridge.—Change-over.—Sanction has been received by the Urban District Council to the borrowing of £6,175 for work in connection with the change-over scheme.

High Wycombe.—Electric Pumping Machinery.—The Town Council has decided to use electricity for water pumping. Estimates show that the machinery will cost £5,600.

Hoylake.—Loan Sanctioned.—The Urban District Council has received sanction to a loan of £10,000 for electricity purposes.

Hull.—Street Lighting Inquiry.—A public inquiry is to be held at Hull into the application of the Corporation for sanction to a loan required for the conversion of the street lighting from gas to electricity.

Loan Sanctioned.—Sanction to a loan of £100,000 for general electricity purposes has been received by the Town Council.

Inverness.—Inquiry.—An inquiry was held on February 24th by the Electricity Commissioners in connection with an application by the Town Council to extend its area of electricity supply outside the burgh boundaries. The application was opposed by the trustees of the late Mr. R. L. MacKintosh, of the Inshes, on whose estate, situated outside the town, there is a hydro electric installation. The chairman was Mr. Henry Nimmo, chief engineering inspector, Electricity Commission. Mr. George Smith Laing, town clerk, represented the Corporation, and Mr. A. L. Innes, advocate, Edinburgh, acted for the objectors. At the opening of the proceedings Mr. Laing said there was good reason to believe that the trustees who were the objectors had sold the Inshes, including the hydro-electric undertaking. If that were correct then they had no interest and ought not to object to the town's application. Still less had the new proprietor a right to object, for he did not lodge any objection, nor was he in a position to do so when the present application was made. Mr. Innes pointed out that the Inshes installation was a private one, £7,000 having been spent on it, and it was only fair that an opportunity should be given to them to develop the scheme and not be at the mercy of the Town Council.

Giving evidence, Mr. Cecil A. Grut, burgh electrical engineer and manager, said that the agreement of the Council to take surplus energy from Inshes plant terminated in October, 1930, and since then the town had had its own hydro-electric scheme at the Bught. It was not then a commercial proposition to take electricity from Inshes when the town had its own plant, and the Inshes scheme was thereafter run as a separate undertaking. The Corporation undertaking was increasing so rapidly that the Council was now formulating an application to install additional generating plant at an estimated cost of £23,000.

For the objectors, consumers gave evidence as to the efficiency of the supply from Inshes. Mr. J. C. Murray, consulting, mechanical and electrical engineer, said that he considered that the plant was of great assistance to the Inverness Corporation undertaking as an auxiliary. Mr. J. Macbean, branch manager of Edmundsons Electricity Corporation, Ltd., who also gave evidence, held that the Inshes plant was adequate to meet the requirements of its area.

The Commissioner inspected the plant at Inshes and the inquiry was closed.

Isle of Wight.—Special Order.—The Isle of Wight Electric Light & Power Co., Ltd., has applied to the Electricity Commissioners for a Special Order authorising it to supply electricity throughout the whole island.

Japan.—Hydro-electric Development.—Preliminary investigations have now been completed with regard to the scheme for the development of the Chosinko River in Korea. A concession for the development of 200,000 kW has been granted but the initial project is for only 100,000 kW.

Kingston-on-Thames. — Assisted Wiring. — The Town Council has applied for sanction to a loan of £3,000 to enable an assisted wiring scheme to be brought into operation

Lanarkshire.—Abandonment of Cambuslang Undertaking.—Negotiations are proceeding between the County Council and the Clyde Valley Electrical Power Co. with a view to the abandonment of the County electricity works at Cambuslang.

London.—Hammersmith.—The Borough Council Electricity Committee has under consideration the question of the preparation of a scheme for generally improving the public lighting in the borough. There still remain approximately 1,272 100-W lamps in various streets, which the borough electrical engineer recommends should be elevated on extension brackets and equipped with 200-watt lamps. In addition, there are 178 gas lamps to be converted to electric lighting. The total estimated cost of carrying out these improvements amounts to £5,380. The Committee proposes that the works should be proceeded with in stages.

Poplar.—The Borough Council has established an installations department in connection with the electricity undertaking. The new department is to operate experimentally for a period of twelve months.

The Electricity Committee is considering a scheme for installing alternative oil-fuel burners in the new station. It is estimated that the proposed scheme will cost £2,462.

Islington.—The Borough Council Electricity Committee has voted £5,168 for the replacement of h.p. and l.p. rubber-insulated mains.

Newcastle-upon-Tyne.—Overhead Lines.—The Newcastle-upon-Tyne Electric Supply Co., Ltd., is to erect overhead electric lines at Linton and Old Moor, near Morpeth.

Northampton.—New Sub-stations.—The Northampton Electric Light & Power Co., Ltd., is to erect sub-stations in Windsor Terrace and Kerr Street.

Northern Ireland.—Electrical Development Scheme.—A Bill providing for a comprehensive scheme of electrical development in the Northern area is to be introduced during the coming session of the Northern Ireland Parliament by the Ministry of Commerce. Transmission lines, switchgear and transformer stations alone would cost about £250,000, and a further £250,000 would be required to purchase existing electricity undertakings. The work would take about three years to complete.

Peru. — Water-power Resources. — The water-power resources of Peru are estimated at 4,500,000 h.p., of which up to 1926—the last year for which statistics are available—only 55,000 h.p. had been utilised. In 1922 hydraulic installations in connection with mining operations totalled 26,000 h.p. In addition there were about 15 hydro-electric installations for municipal lighting and power, with a total of about 20,000 h.p., the chief of which were situated at Santa Rosa, Yanacota, and Chosica. A hydro-electric station is under construction at Malpaso, twenty miles from Oroya, which will have a capacity of 35,000 h.p.

Preston.—Charges in Outer Areas.—For the time being, the operation of a new tariff to apply to property on the outskirts of the borough has been suspended. The Corporation Electricity Committee recently received a resolution of protest from the Penwortham Property Owners' Association regarding the "home system" tariff.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

Tain.—Lighting: From 1s. to 9d. per kWh, as from May next.

Islington.—Charges for electricity supply to ordinary consumers: From 3¼d., ¼d., and ¼d. less 10 per cent. per kWh to 3d., ¾d., and ¾d. less 10 per cent., respectively.

Plymouth.—A reduction to consumers of 5 per cent.

Cheadle and Gatley.—Ordinary lighting in the Cheadle and Gatley area: From 6d. to 5d. per kWh. Outside the area: From 6½d. to 6d. per kWh. Heating in the area: 1d. per kWh flat rate for the whole year, in lieu of 1d. for the summer quarters and 1¼d. for the winter quarters. All-in rate: A reduction in the fixed charge from 20 per cent. to 17½ per cent., with a minimum of £3 10s. per annum in lieu of £4. Slot meters: From 8d. to 7d. per kWh.

Ripon.—Assisted Wiring.—The Town Council has decided to install electricity in 46 houses on the Corporation housing estate under the assisted wiring scheme. A similar step is to be taken in respect of other houses in course of erection.

Samoa.—Hydro-electric Development.—A small hydro-electric power station has recently been completed at Magiagi on the island of Upolu, in Western Samoa. The water supply for the turbine is obtained from the Vaisigano River. Difficulty was experienced in laying the pipe line owing to the expansion and contraction caused by the excessive heat during the day and the low night temperature. The tendency to buckle was overcome by lining up and levelling only short sections at a time until the joints were caulked and leaded, then the lower end of the pipe line was connected to the town water supply main through a check valve and the pipe was filled with water as far as possible and thus kept at an even temperature. The installation comprises a "Metrovick" 80-kVA, 2,200-V, 3-phase, 50 cycle alternator, with a belted exciter, driven by two 70-h.p. Pelton wheels working under a head of 187 ft.

Shipley.—Loan.—The Urban District Council Electricity Committee is applying for sanction to a loan of £10,000 for mains.

Stoke-on-Trent. — MAINS EXTENSIONS. — The Corporation Electricity Committee is to extend mains at a total estimated cost of £1,980. The Committee has also considered the question of supply in a further portion of Weston Road, Meir, and has decided to apply for sanction to the borrowing of £1,700, the estimated cost of the proposed works. The engineer has been asked to prepare a scheme for supplying 528 houses proposed to be erected at Meir Cross Road.

LOANS SANCTIONED.—Sanction has been received to the borrowing of £10,000 for general change-over, £6,800 for mains and sub-station equipment, and £3,040 for plant.

Sunderland.—RELIEF OF RATES.—The Town Council has accepted a proposal to take £12,000 from the profits of the Corporation electricity and tramway undertakings for the purpose of reducing the rates.

Swansea.—PROPOSED EXTENSIONS.—The Corporation Electricity Committee is considering extensions to mains and the provision of three sub-stations in outlying districts at an estimated cost of £35,000.

Wigtown.—SPECIAL ORDER.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation a Special Order made by them authorising the Holderness Trust, Ltd., to supply electricity in the county of Wigtown.

Willesden.—NEW SHOWROOMS.—New showrooms for the Urban District Council's Electricity Department are to be opened by Mr. S. P. Viant, M.P., Assistant Postmaster-General, at 131, Salusbury Road, N.W.6, on March 14th.

Witney.—EXTENSIONS.—The Urban District Council has decided to proceed immediately with the extension of mains in the Church Green and Crofts area.

York.—LOANS SANCTIONED.—The Corporation Electricity Committee has obtained sanction to the borrowing of £22,275 for mains, £2,180 for transformers and switchgear, and £1,470 for meters.

Tramway and Railway Notes.

Argentina.—RAILWAY ELECTRIFICATION.—A message from Buenos Aires states that an Argentine railway is about to conduct experiments with Diesel-electric motor tractors for part of its suburban lines, and that another system will shortly present plans for the electrification of part of its suburban service. It is thought that before many years have passed the whole of the Buenos Aires suburban railway services will be electrically operated, and future extensions of track are being planned with this in view.—*Reuter's Trade Service* (Buenos Aires).

Blackburn.—CONTRIBUTION TO RELIEF OF RATES.—The Corporation Tramways Committee is making a contribution of £8,000 to the relief of rates.

Darlington.—RAILLESS-CAR PROGRESS.—An increase of £4,000 in the revenue obtained from the railless cars is expected by the Corporation Transport Department for the year ending March 31st next. The net profit is estimated at nearly £7,000. The number of passengers carried show an increase of about 750,000, as compared with last year.

Edinburgh.—PURCHASE OF PART OF MUSSELBURGH TRAMWAYS. —Subject to Parliamentary sanction an agreement has been approved by the Corporation Public Utility Committee for the purchase of the Joppa-Levenhall section of the Musselburgh tramway system at a cost of £3,000.

London.—LONGER "METRO" TRAINS.—It is proposed to use longer trains on the Metropolitan Railway as soon as alterations and extensions to various station platforms have been completed.

NEW TRAMCARS.—The Highways Committee of the London County Council recommends the purchase of 60 additional tramcars at an estimated cost of £182,500.

London Midland & Scottish Railway Company.—ELECTRIFICATION PROGRESS.—At the annual meeting of the company held last Friday reference was made to the good progress which is being made with the construction of the new lines for electric traction between Barking and Upminster, a distance of 7¾ miles. At present electric train services operated by agreement with the District Company between London and places on the L.T. & S. section terminate at Barking, and these works will enable electric train services to be extended to Upminster. This widening and extension of electric services was necessary in order to deal with the rapidly increasing local traffic, particularly in connection with the London County Council's housing estate at Becontree. It is hoped that the electric services on the Manchester, South Junction and Altrincham Joint Railway will be in full operation in from four to six months. Schemes have also been under consideration for the electrification of a number of other provincial suburban lines. Arrangements with the Mersey Railway for the establishment of a through electric service from and to the Wirral Peninsula, and the consideration of an alternative scheme, have not yet been completed. Recent developments in the electrical operation of both points and signals has reduced expenditure considerably, fifty-seven schemes having been completed during the past two years. The annual amount thus saved totals £12,257. At the end of last year further schemes were authorised which will yield an economy of £11,500 per annum.

Norwich.—TRAMCAR IMPROVEMENTS.—Improvements in seating accommodation and lighting arrangements are to be carried out on a number of the tramcars belonging to the Norwich Electric Tramways Co.

Scarborough.—TRAMWAY ABANDONMENT.—The Town Council in Committee has approved a proposal that the Corporation should purchase the local tramway undertaking and discontinue the service. It is further suggested that the Council should reinstate the roads after the removal of the track and enter into an agreement with the United Automobile Service, Ltd., to operate the transport service for 23 years. The cost of purchasing the tramways, including the reinstatement of roads, will be about £30,000.

Southern Railway.—ELECTRIFICATION PROGRESS.—It was stated at the annual general meeting of the company held last week, that the electrification of the lines to Brighton and Worthing was well in hand, and about 40 miles of conductor rail out of a total of 162 track miles had already been laid. In the electrified area 12,592,000 more passengers were carried than in 1929, with an increase of receipts of £192,000. Outside the electrified area the number of passengers decreased by 959,000 and the receipts by £544,000.

Telegraph and Telephone Notes.

India.—TELEGRAPHY.—It is understood that the 6,000 mile telegraph line known as the "Indo-Route" was closed on February 28th. It has been worked by the Indo-European Telegraph Co. from London to Teheran, Persia, and by the Indo-European Telegraph Department of the Government of India from Teheran to Karachi, in India. The lines have been taken over by the countries through which they pass, and the sea cable by Imperial and International Communications, Ltd. The line was opened in January, 1870, and ran from London through Germany, Poland, Russia, and Persia to the head of the Persian Gulf, thence by cable to India.

International Telephony.—ANGLO-ITALIAN SERVICE.—It was announced last week that the Anglo-Italian telephone service had been extended beyond Rome to all parts of Italy and Sicily.

ANGLO-HUNGARIAN SERVICE.—A direct telephone service between London and Budapest was inaugurated last week.

ANGLO-URUGUAYAN SERVICE.—The telephone service from Great Britain to Uruguay, hitherto restricted to calls to Monte Video, is now available to Rosario, Colonia, and Colonia Suiza at the same rates.

ANGLO-AUSTRALIAN SERVICE.—The two-thousandth telephone call between this country and Australia was effected last week. The service was inaugurated on April 30th last.

Malaya.—TELEPHONY.—The annual report of the Federated Malay States Posts and Telegraphs Department shows that at the end of 1929 the number of direct exchange lines connected to the telephone system was 5,075, an increase of 541 on the figure for 1928. There were, in addition, 2,403 miscellaneous circuits The revenue derived from telephony was $1,352,935, an increase of $156,151. There were 65 public exchanges in service in the F.M.S., and 95 public call-offices were available at post offices and postal agencies throughout the country. The average number of originated calls per direct exchange line per day was 12.7, an increase of approximately 12.4 per cent. on the 1928 average figure.

Northern Ireland.—TELEPHONY.—From the annual report of the Northern Ireland postal telephone district it appears that the number of telephone exchanges in Northern Ireland at the end of 1930 was 162, that during last year 3,309 new stations were added to the system, and that the leased stations numbered 1,638, leaving a net increase of 1,671 stations. In the city of Belfast there was one station to every 26 persons, and in the Northern Ireland area one station to every 52 persons.

Philippine Islands.—TELEPHONY.—The Philippine Long-distance Telephone Co. recently announced its decision to construct an extensive long-distance system covering the entire rice-producing district of Central Luzon, following a policy of development adopted by the company when it took over the Manila and suburban system of the Philippine Telephone and Telegraph Co. and other telephone companies in the Visayan Islands. The proposed system will cover nine of the principal rice-producing centres in the provinces of Nueva Ecija and Bulacan. It is to be a distinct line connecting Cabanatuan, Nueva Ecija, directly with Manila. Exchanges will be established at the following points: Santa Rosa, Penarunda, Gapan,

San Isidro, Baliuag, San Miguel de Mayumo, San Ildefonso, and Quingua. In all there will be 74 miles of line. The Philippine Co. now has in operation some 44 miles of telephone line connecting the principal business centres in Luzon with Manila. In addition to these developments, it is understood that plans are now being made to establish a telephone system in Zamboanga, which will eventually be connected with the other systems.

Russia.—Radio-telegraphy.—Direct wireless telegraph communication has recently been established between Soviet Russia and the United States.

Scotland.—New Cable.—The s.s. *Glengloy* in Oban Bay took on board a cable about a mile in length which is to replace the existing cable between Mull and Iona. The *Glengloy* has been chartered to lay the cable in place of the cable ship *Monarch* owing to the shallowness of the water.

The Telephone Service.—Large Private Exchange.—A private exchange in London which deals with more than 20,000 calls a day and now claims to be one of the largest private switchboards in the whole country is situated in an Oxford Street store. It has 138 external Post Office lines and 620 extensions within the building. Between 1 and 6 o'clock on one afternoon last year there were no fewer than 13,662 effective calls as well as 2,760 calls which the p.b.x. was not able to cope with, hence the need for new lines which have recently been added. At night time the service is kept in operation principally in case of fire, direct communication being available to the switchboard from 90 call boxes and 120 watchmen's "clock points" within the building.

"Cradle" Instruments.—The Post Office has placed a further order for 25,000 of the hand-microphone, or "cradle," type of telephone with Messrs. Siemens Bros., of Woolwich, in addition to 50,000 instruments which are now being delivered. Since the extra rental charge for this pattern of telephone was reduced by half to twopence a week, the demand has increased by more than 300 per cent. "Neophones," as they are correctly called, are very convenient, because they leave one hand always free when telephoning, while the audibility is appreciably better than with the older type of instrument. In America an extra annual fee of twelve shillings is made.

Radio Notes.

Arctic Radio Stations.—Tromsö.—We are informed that last week's reference to the new broadcasting station at Bodö, Norway, as being the most northerly in Europe is not quite correct. It seems that a 0.5-kW transmitter has been working regularly for more than two years at Tromsö, Finmarken, which is several hundred miles nearer the North Pole than Bodö. The station uses its own studio and also relays the Oslo programme.

Czecho-Slovakia.—New Stations.—It is expected that during the next few days the first test transmissions will be made from the new Brno transmitter, and in about a month's time the new high-power Cesky Brod station will begin experimental transmissions. Brno's aerial power has been increased to 36 kW, but it will continue to use its present wavelength of 341.7 metres. Cesky Brod, which will have an aerial power of 60-120 kW, will take over Prague's present wavelength of 487 metres, and Prague will use Czecho-Slovakia's shortest wavelength of 249.6 metres (1,202 kc/s).

Germany.—Census.—The broadcasting authorities are conducting a postal census of listeners to ascertain what types of receiver are in most popular use, in order that the information may be used as a basis for determining the power of the various broadcasting stations.

Hungary.—Projected Station.—At a cost of about £600,000 the Hungarian Radio Company is contemplating erecting a new station of 150 kW power. The company, in which the State is a shareholder, has an income from subscribers of more than £150,000 a year.

North Regional Station.—Tests.—Trial transmissions of relayed music commenced this week from the new B.B.C. northern regional station at Moorside Edge, near Huddersfield, on a wave-length of 479 metres, which is at present used by the midland regional station.

Switzerland.—New Station.—Tests were carried out last week on the new 25-kW broadcasting station that has recently been manufactured and installed by Standard Telephones and Cables, Ltd., at Söttens.

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the Electrical Review containing the advertisement is given in parentheses below.

Contracts Open.

Australia. — Adelaide. — March 31st. South Australian Government. Alternator, switchboard, transmission lines and motor-driven centrifugal pumps for the Moorook and Kingston pumping station. (A.X. 10806.)*

Belgium.—Brussels.—The Société Nationale des Chemins de Fer Belges announces that it will shortly be inviting a limited number of tenders for the supply of eight electric capstans. Firms desirous of being taken into consideration should communicate with the Service du Materiel, S.N.C.F.B., Division les Achats, Bureau 26-5, 21, Rue de Louvain, Brussels.

Bromley (Kent).—March 16th. Corporation. Wiring of houses on the Southborough housing estate. (February 27th.)

Cardiff.—March 18th. Electricity Department. E.h.p. and l.p. paper-insulated cables. (See this issue.)

Dartford.—March 21st. Urban District Council. 250-kW rectifier equipment. (See this issue.)

Dolgelley.—March 26th. Governors of Dr. Williams's School. Electric wiring of school. (See this issue.)

Dundee.—March 11th. Electricity Department. Coal and ash handling plant. (February 20th.)

Durham.—County Council. Installation of electric lighting at twelve schools.

Egypt.—Cairo.—Ministry of the Interior. April 18th. Ice making plant and accessories. (A.X. 10785.)*

March 21st. 538-kVA lighting installation for the town of Dessouk. (A.X. 10803.)*

April 21st. 494-kVA lighting installation. (A.X. 10804.)*

May 2nd. 250-kVA lighting installation for Asswan. (A.X. 10802.)*

April 15th. Ministry of Public Works. Diesel-electric propelling machinery for Seru oil tanker. Copy of specification and conditions of tender can be obtained from the Office of the Director-General, Mechanical and Electrical Department, against payment of 250 mills.—*Reuter's Trade Service* (Cairo).

Fareham (Hants).—March 14th. Knowle Mental Hospital. Pumps, booster, switchboard, cables, &c. (February 27th.)

Glasgow.—March 18th. Commissioners of H.M. Works. Installation of an electric passenger lift in the new Central Employment Exchange, Waterloo Street, Glasgow. Specifications (£1 1s.), from engineer, H.M. Office of Works, 122, George Street, Edinburgh.

India.—New Delhi.—March 30th. Indian Stores Department. 500-kW rotary convertor, transformer, starting panel, h.p. and l.p. switchgear. (A.X. 10801.)*

Long Eaton.—March 12th. Electricity Department. Twelve months' supply of cables, meters, cut-outs, &c. (February 20th.)

London.—Central Electricity Board.—March 9th. 33-kV overhead transmission lines in connection with the North-West England and North Wales Electricity Scheme. (January 30th.)

March 16th. Construction of site works, foundation works and buildings at Barton and Warrington in connection with the North-West England and North Wales Electricity Scheme. (February 20th.)

Hammersmith.—Electricity Department. Air-cooled transformers. (February 20th.)

County of London Electric Supply Co., Ltd.—March 18th. Condenser tubes in connection with the Barking power station extensions. (February 20th.)

April 1st. Boiler house coal-handling plant in connection with the Barking power station extensions. (February 20th.)

Milford Haven.—March 14th. Electricity Department. Electrical materials, including meters. (February 27th.)

Morocco.—March 16th. Compagnie Franco-Espagnole des Chemins de Fer de Tanger à Fez, Paris (280 Boulevard Saint Germain). About 500 tons of copper cable and wire for a 3,000-V transmission line between Fez, Meknes and Petit Jean.

New Zealand.—Wellington.—May 27th. Post and Telegraph Department. Branch telephone equipment. (A.X. 10812.)*

Oldham.—March 16th. Gas Committee. Higginshaw gas works reconstruction scheme. Contract No. 9, 125-kW steam engine driven d.c. generating sets. Specification (deposit £2 2s.) from Mr. E. Parry, commercial manager, Gas and Water Offices, Greaves Street.

March 19th. Public Assistance Committee. Supply of electric lamps and fittings for Rochdale Road Institution. Form of tender from the public assistance officer, Rochdale Road.

Portsmouth.—March 18th. Corporation. Installation of electric lighting at sewage collecting tanks, near Fort Cumberland. (February 20th.)

Electricity Department. Three months' supply of l.p. cables. (February 27th.)

Plymouth.—March 14th. Corporation. E.h.p. switchgear. (February 27th.)

Radcliffe.—March 17th. Electricity Department. E.h.p. and l.p. underground cables. (See this issue.)

Rhondda.—March 28th. Electricity Department. Meters, copper wire, joint boxes, cut-outs, &c. (February 27th.)

South Africa.—PORT ALFRED.—March 14th. Municipal Council. Electrical plant, including engines and alternators, steel poles, copper wire, insulators, switchboard, meters, house service fuses, and street lighting suspension fittings.

QUEENSTOWN.—April 11th. Municipal Council. Turbo alternators, spray-cooling plant, rotary feed pump, &c. (A.X. 10800.)*

JOHANNESBURG.—March 28th. City Council. 12,600 porcelain insulators of various kinds. (A.X. 10807.)*

Staffordshire.—March 25th. County Education Committee. Electric lighting and power installations at Quarry Bank and Upper Penn Manor Road Senior Schools. (See this issue.)

Stoke-on-Trent.—March 11th. Electricity Department. Twelve months' supply of mains, cables, static transformers, and e.h.p. truck-type switchgear. Also battery for electric vehicle. (February 20th.)

Tilbury.—March 16th. Urban District Council. Electric lighting and cooking installations in Council houses. Also supply of 120 domestic cookers. (See this issue.)

Turton.—March 17th. Urban District Council. Cable, meters, joint boxes, ironclad fuses, sealing chambers and meter boards. Form of tender, &c., from the electrical superintendent, Council Offices, Bromley Cross.

Warrington.—March 9th. Electricity Department. Motors and transformers. (February 20th.)

Worsley.—March 12th. Urban District Council. Twelve months' supply of electric lamps. Form of tender from Mr. J. Howard, surveyor to U.D.C., Town Hall, Walkden.

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed.

Bath.—Education Committee. Accepted :—
Wiring for electric lighting and other purposes at the new secondary school at Beechen Cliff (£1,370).—H. L. Bush & Co.

Bridlington.—Town Council. Accepted :—
Electric lighting installation, municipal offices (£529).—G. H. Jarvis & Sons.
L.p. cables, boxes and road work (£8,450).—Callender's Cable & Construction Co., Ltd.
Transformers and oil treating plant (£1,716).—Crompton Parkinson, Ltd.
Switchgear and kiosks (£4,107).—Ferguson, Pailin, Ltd.

Denny and Dunipace (Stirlingshire).—Town Council. Accepted :—
Electrical work at new Town House.—E. Masson.

Durham.—County Council. Accepted :—
Installation of electric lighting in schools :—Chester-le-Street (£196), Sleigh & Wood; Marsden (£102), R. Beck & Co.; Newfield (£70), W. Sykes & Son; Witton Gilbert (£81), B. L. Oliver; Chester-le-Street secondary school (£194), F. Reid, Ferens & Co.; Hookergate (£669), Law & Sons; West Stanley (£351), J. Mayo and Sons; Wolsingham grammar school (£506), Mr. Robson.
Electric lighting at sanatorium extension (£114).—Kelly and Co.

Gateshead.—Corporation. Accepted :—
Six automatic traffic signals (£800).—J. H. Holmes & Co., Ltd.

Halifax.—Town Council. Accepted :—
Installation of electric light at 14 houses at Moor End Road.—J. Pilling & Co.
Plant for boiler house extensions at the electricity works (£2,094).—Babcock & Wilcox, Ltd.

Hull.—Telephones Committee. Recommended :—
Switchboards (£228).—Ericsson Telephones, Ltd.
Education Committee. Accepted :—
Electric lighting at Clifton Street school (£324).—Napier and Wheeldon.
Electric lighting at Middleton Street school (£474).—Accumulator Charging Co.

Lancaster.—Corporation. Accepted :—
Switchgear for North Road sub-station (£3,125).—A. Reyrolle & Co., Ltd.

London.—POPLAR.—Electricity Committee. Recommended.—
Coal-handling plant: Hopper (£114).—Matthew T. Shaw and Co., Ltd. Measuring and conveying apparatus (£295).—Lea Recorder Co., Ltd.
LONDON COUNTY COUNCIL.—Highways Committee. Accepted :—
Electrically-driven feed pump for Greenwich power station (£1,207).—**Mather & Platt, Ltd.**
SOUTHWARK.—Electricity Committee. Recommended :—
Convertor, battery booster, switchboards and crane, &c. (£15,326).—General Electric Co., Ltd.

Manchester.—Transport Committee. Accepted :—
Electric heating at Princess Road 'bus garage.—Saunders and Taylor, Ltd.
Electricity Committee. Accepted :—
Electric cookers.—Jackson Electric Stove Co., Ltd., Credenda Conduits Co., Ltd.; Siemens Electric Lamps and Supplies, Ltd.; General Electric Co., Ltd.; Revo Electric Co., Ltd.
Alterations and additions to flue ducts, dampers, &c., at Barton station.—Simon-Carves, Ltd.

Middlesex.—County Council Health Committee. Recommended :—
Switchboard for Springfield mental hospital (£458).—Westwood Manufacturing Co.

Salford.—Electricity Committee. Accepted :—
Cable.—W. T. Glover & Co., Ltd. (£120); N.V. Nederlandsche Kabelfabriek, Delft.

Sheffield.—Electric Supply Committee. Accepted :—
Copper bonds.—British Insulated Cables, Ltd.

Wimbledon.—Electricity Committee. Accepted :—
L.p. switchgear (£1,163).—George Ellison, Ltd.
H.p. switchgear (£757).—English Electric Co., Ltd.
E.h.p. switchgear (£623).—A. Reyrolle & Co., Ltd.
Cable (£5,281).—Derby Cables, Ltd.

York.—Transport Committee. Recommended :—
Three railless cars (£1,457 each).—Clough, Smith & Co., Ltd.

Forthcoming Events.

Leeds Electrical Club.—Friday, March 6th. Members' dinner at the Leeds and County Conservative Club. 6.30 for 7 p.m.

Association of Mining Electrical Engineers (London Branch).—Saturday, March 7th. 1.15 p.m. Visit to Messrs. Fuller's works at Walthamstow.

(Western Sub-Branch).—Saturday, March 7th, Swansea. "Drives on Electrical Machinery in Mines." Mr. C. E. Yates.

(South Wales Branch).—Saturday, March 14th. South Wales Institute of Engineers, Cardiff. 6 p.m. "Electric Control Gear." Major W. Roberts.

Royal Society of Arts.—Monday, March 9th. Adelphi, London. 8 p.m. Cantor Lecture I. "Sound Recording and Reproducing Machines and their Development." Capt. A. G. D. West.

Institute of Metals.—March 11th and 12th. Institution of Mechanical Engineers, London. Annual meeting. Wednesday, March 11th. Trocadero Restaurant, W. 7 for 7.15 p.m. Annual dinner and dance.

Chartered Institute of Patent Agents.—Thursday, March 12th. Hotel Victoria, Numberland Avenue, W.C. 7.15 for 7.30 p.m. Institute dinner.

Institution of Electrical Engineers.—Thursday, March 12th. Institution, London. 6 p.m. "Heavy-duty Rectifiers and their Application to Traction Sub-stations." Messrs. J. W. Rissik and H. Rissik.

(Meter and Instrument Section).—Friday, March 6th. Institution, London. 7 p.m. "The Electrical High-pressure Testing of Cables and the Localisation of Faults." Mr. J. Urmston.

(North-Eastern Centre).—Monday, March 9th. Armstrong College, Newcastle-upon-Tyne. 7 p.m. "Heavy-duty Rectifiers and their Application to Traction Sub-stations." Messrs. J. W. Rissik and H. Rissik.

(Sheffield Students' Section).—Monday, March 9th. Y.M.C.A. Building, Fargate, Sheffield. 7.30 p.m. Film, entitled "The Story of Bakelite Resinoid."

(North-Western Centre).—Tuesday, March 10th. Engineers' Club, Manchester. 7 p.m. "Two Transmission Line Problems: Suspension Insulators for Industrial Areas in Great Britain; Conductor Vibration." Mr. P. J. Ryle.

(Scottish Centre).—Tuesday, March 10th. Institution of Engineers and Shipbuilders in Scotland, Glasgow. 7.30 p.m. "High-voltage Testing Equipments." Messrs. E. T. Norris and F. W. Taylor. "Dielectric Phenomena at High Voltages." Messrs. B. L. Goodlet, F. S. Edwards, and F. R. Perry.

(Hampshire Sub-Centre).—Wednesday, March 11th. Municipal College, Portsmouth. 7.30 p.m. Lecture by Mr W. D. Dye.

(North Midland Centre).—Friday, March 13th. Hotel Metropole, Leeds. 7 for 7.30 p.m. Annual dinner.

(London Students' Section).—Institution, London. 6.15 p.m. "Aspects of Transmission and Reception of Still Pictures." Mr. C. J. F. Tweed.

(South Midland Students' Section).—Saturday, March 14th. Visit to Hams Hall power station, Birmingham.

Birmingham Electric Club.—Friday, March 13th. Grand Hotel, Birmingham. Annual dinner.

British Electrical Development Association.—Friday, March 13th. Royal Society of Arts, London. 7.30 p.m. Salesmanship Conference. "Do we Believe our Own Story?" Mr. R. W. Kennedy.

Institute of Fuel.—Friday, March 13th. Engineers' Club, Manchester. 7 p.m. Joint meeting with the Manchester Association of Engineers. "The Industrial Application of Pulverised Fuel." Dr. G. E. K. Blythe.

Junior Institution of Engineers.—Friday, March 13th. Institution, London. 7.30 p.m. "Phenol Formaldehyde Moulding Compositions; Manufacture and Use." Mr. L. Clegg.

The "Electrical Review" Service Department.

Inquiries must be accompanied by a stamped addressed envelope.

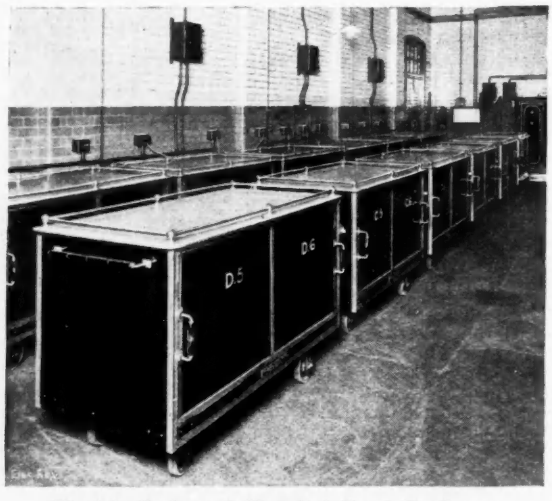
We shall be glad to learn the names and addresses of makers of the following devices:—

Birum Vacuum Cleaner.
Celerphone telephones.

Notes.

A Hospital Cooking Installation.

Among the hospitals in London in which electrical cooking has been adopted is the West Ham Municipal Hospital at Whipps Cross. In its large and spacious kitchens, which cater for 900 patients daily, the electrical equipment includes two ovens which roast daily approximately 350 lb. of meat, poultry, &c., while all supplies of bread, cakes, milk puddings, special invalid preparations, &c., are cooked in two standard double-deck Peel baking ovens. A supplement to the general equipment is a fleet of twelve electrically-heated food trolleys specially designed for the rapid transit of cooked food direct from the kitchen to the wards. These trolleys are mounted on ball-bearing, rubber-tired swivel wheels, and are built up of sheet steel, with sliding doors, and a polished steel top provided with nickel-plated rails. The trolleys are connected up to conveniently placed wall plugs and a standard temperature is maintained inside them, so that cooked meats, vegetables, and all accessories can be loaded into them immediately they are ready.

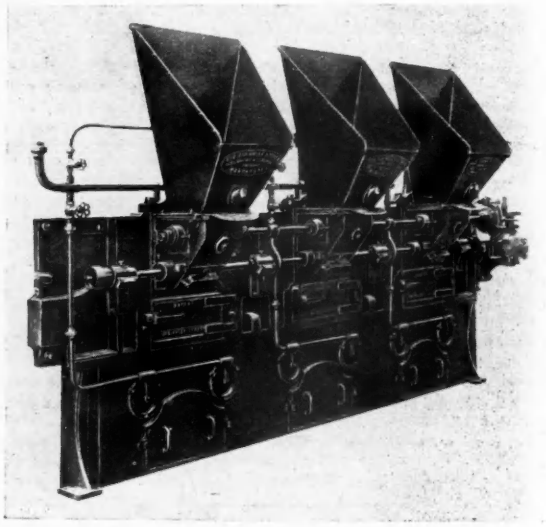


Electrically-heated Hospital Food Trolleys.

The use of electric roasting ovens in combination with these quick travelling trolleys has proved also of inestimable relief to the kitchen staff, enabling them in periods of stress to gain almost an hour on the previous time occupied in transport. This is effected by the earlier cooking of meats, &c., in the ovens and their transfer when done into the heated trolleys, where they remain while further supplies are dealt with. The ovens and trolleys were supplied by the General Electric Co., Ltd., the trolleys being specially designed by that concern in conjunction with the chief engineer of the hospital.

"Meldrum" Stokers.

Approximately twelve months ago Messrs. Meldrums, Ltd., fitted one of their sprinkler mechanical stokers to a large Stirling-type boiler for the English Electric Co., Ltd. It was installed for the purpose of eliminating smoke and utilising cheaper fuel, and so successful was the installation that a saving of over £50 a week was claimed to have been realised in the fuel bill. The company recently received the order to fit a second similar boiler, which has now been supplied. We think this is a record saving in fuel on one boiler, the particulars of which are as follows:—The boiler is



"Meldrum" Hoppers and Distributors.

of the Stirling type, having a heating surface of 4,370 sq. ft., a width between the walls of 11 ft. 7 in., and an evaporative capacity of about 13 000 lb. per hour. The stoker installation consists of the "Meldrum" sprinkler stoker having three hoppers and distributors, as shown in the accompanying illustration. A special feature of the sprinkler mechanism is its extreme simplicity and silence in operation. It consists of a revolving distributor that is controlled by a ratchet, which determines the amount of fuel fed to the grate. The fuel is distributed by a two-vaned beater, which is so shaped as to give perfectly even distribution of the fuel on the grate. Forced draught is by means of the well-known "Meldrum" steam jet blowers and the gearing driving the sprinkler mechanism is enclosed and runs in an oil bath.

Welding Prize Competition.

The winner of the operatives' prize competition, 1930, organised by the Institution of Welding Engineers, was declared at a recent meeting of the Institution to be Mr. E. Storey, of Billingham, who was awarded the Gold Medal, and also the prize and a certificate; silver medals were handed to those whose papers were highly commended. Mr. Storey then read his paper, which was entitled "Welding Practices and Methods Based on my Own Experiences," which was illustrated with lantern slides and was followed by a discussion. It was the first competition of its kind to be held in this country. Mr. Storey is at present employed by Synthetic Ammonia and Nitrates, Ltd., and his paper discussed a number of jobs done in the works of that company, which were mostly carried out with "Premier" and "A.W.P." electrodes; it will be issued shortly in volume form together with the other papers which were highly commended.

Electrical Association for Women.

The Liverpool and District branch of the Association paid a visit to the Liverpool Corporation electric power station at Lister Drive on February 23rd. This was the first visit of the branch, and the facilities which were afforded by the city electrical engineer, Mr. P. J. Robinson, M.I.E.E., were very much appreciated.

On February 24th 200 members of the Birmingham and Midlands branch visited the Castle Bromwich section of the British Industries Fair at the invitation of the Electrical Section Committee. At tea Mr. G. P. Achurch, M.B.E., and Mr. Llewellyn Atkinson spoke, and Mrs. H. K. Beale, president, and Mrs. M. Howie, hon. treasurer, responded. Mrs. Beale said that the local branch of the E.A.W. was now 400 strong and that its fifth year was nearing completion. The committee had arranged to open small offices in Birmingham on March 25th.

On the same date a large party of E.A.W. members visited the ticket-checking section at Brixton and the drivers' motor school of the London County Council tramways. Mr. J. H. Parker, electrical engineer to the L.C.C. tramways, was pre-

sent, and invited the members to visit the Council's power station at Greenwich later in the year.

Three Dances.

I.E.E. STUDENTS.—So successful was the supper-dance given by the I.E.E. London Students' Section last November, and so great the unsatisfied demand for tickets, that it was decided to repeat the event on February 26th at the Victoria Halls, London, W.C., as before. This was again organised by Mr. J. W. Moffatt, Mr. G. J. Shaw (vice-chairman, Section Committee) acting as Master of Ceremonies. Variety was given to the proceedings in many ways and the function was quite evidently enjoyed to the utmost by the 160 or so people taking part.

STANDARD TELEPHONES & CABLES, LTD.—The dance organised by Mr. E. C. Griffiths, general secretary of the Athletic and Social Club of the company, took place on February 27th at the Royal Opera House, Covent Garden, London, W.C. The function served a good purpose in bringing together in a social atmosphere members of the staff from the various works and offices of the company to the number of 1,150, including Mr. P. K. Condict, vice-president of International Standard Electric Corporation, managing directors of the European branches of the same organisation, and Mr. E. S. Byng, managing director of Standard Telephones & Cables, Ltd.

E.P.E.A.—LONDON TECHNICAL GROUP.—The third annual dinner-dance of the London Local Group was held at the Café Royal, London, W., on February 28th. The dinner was not graced by speeches, Mr. W. J. Oswald (chairman) only proposing the health of the King and referring to the presence of Mr. P. E. Rycroft and Mr. A. L. Lunn, who had done so much for the Technical Group movement.

The number present was 230, a figure considerably in excess of that of last year; nevertheless, the characteristically intimate atmosphere that has attended these functions was entirely maintained.

Fatalities.

Frederick Dyer, a linesman employed by the Shropshire, Worcestershire, and Staffordshire Electric Power Co., was found dead in a field at Munstone, near Hereford, on February 27th. His hands were gripping a high-voltage cable.

An inquest was held recently on Miss Catherine Levy, of Willesden Lane, Kilburn, aged 50, who received a fatal electric shock whilst using a hair-drier in the bath. Medical evidence was given that death was due to electric shock and burns, and a formal verdict was returned.

Fulham Power Station.

The proposed extension of the Fulham power station is discussed in a report, which, *The Times* states, was to be submitted to the London County Council on Tuesday by its Central Health Committee.

Memoranda have been prepared by Prof. J. S. Haldane and Dr. J. S. Owens for the committee, which makes the following reference to the report of the Electricity Commissioners:—

"Appended to the report was a memorandum (obtained after the inquiry) by Dr. G. S. Simpson, Director of the Meteorological Department of the Air Ministry, in which comments are made on evidence given by Dr. J. S. Owens, one of the council's expert witnesses at the inquiry, as to the possibility of serious danger arising in certain atmospheric conditions from the emission of inadequately heated flue gases (carbon dioxide and carbon monoxide). The Commissioners state in their report that the only conclusion to be drawn from Dr. Simpson's memorandum is that the carbon monoxide discharged with the flue gases would not reach the ground level in sufficient concentration to constitute a danger of the kind anticipated by Dr. Owens. The council had no opportunity at the inquiry of dealing with the contentions in Dr. Simpson's memorandum.

"Since the report of the Commissioners was issued we have been furnished by Prof. Haldane, also one of the council's expert witnesses, and by Dr. Owens, with memoranda dealing with possible danger from carbon dioxide and carbon monoxide in the absence of adequate arrangements for the heating of the gases after they have been subjected to a washing process with a view to the elimination of sulphur compounds. We feel, having regard to these memoranda, that the taking of adequate precautions against the danger which may arise from the emission from the chimneys of the proposed extension of the Fulham electricity generating station of unheated or inadequately heated flue gases is of such importance that it is only right that the views on the matter which have been expressed by the council's expert advisers should be placed before the Electricity Commissioners, the Minister of Health, and the First Commissioner of Works."

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

The *South African Mining and Engineering Journal* reports the arrival in Johannesburg of **Mr. H. Marryat**, who addressed representatives of the local electrical industry on the work and usefulness of an electrical development association. Mr. Marryat later left for Rhodesia, and was to proceed *via* Beira and Mombasa to Khartoum, travelling overland from the latter port.

Mr. Frank W. Smith was recently elected a vice-president of the New York Edison Co., while **Mr. Matthew S. Sloan** was re-elected president.

Mr. C. I. Baker, manager of the Ashton-under-Lyne Corporation Tramway Department, and his wife celebrated their silver wedding on February 21st, and were presented by the administrative staff with a silver siphon holder.

Mr. A. W. Ironside, recently business manager of the Harland Engineering Co., Ltd., has returned to the Vaughan Crane Co., Ltd., Openshaw, Manchester, as director and general manager.

The Kingston-on-Thames Electricity Committee recommends that **Mr. E. S. Whaley**, of the electrical engineer's department, be designated clerk-in-charge and showroom manager at a salary of £325 per annum, that **Mr. E. Williams** be designated consumers' engineer at a salary of £250, inclusive, and that **Mr. E. Wright**, mains foreman, be designated mains superintendent at a salary of £360.

Mr. H. G. Shoolbred, electrical engineer, Luton, has been re-elected a member of the Bedfordshire County Council.

Mr. F. R. Cripps, electrical engineer, Worthing, has been returned unopposed to the West Sussex County Council.

Mr. Charles Richie, Junr., has been appointed assistant electrical engineer to the Hartley Main Collieries.

Mr. F. W. Wheatley has been appointed London representative of the Sterling Varnish Co. His telephone number is "Streatham 7389."

Sir Ernest W. Petter, chairman of Petters, Ltd., has announced his intention of standing as an independent Conservative candidate in the forthcoming Parliamentary by-election at St. George's, Westminster.

Mr. W. B. Hayden, power station superintendent in the Epsom Urban District Council's Electricity Department, has been appointed deputy electrical engineer at a salary of £400 per annum.

Mr. Richard D. Fairclough, M.I.E.E., 11, New Station Street, Leeds, has been appointed sales engineer for Yorkshire by the Craven and District Electric Construction Co., Ltd., of Skipton, in connection with its transmission, distribution, and change-over schemes.

Mr. E. H. Triggs, who for several years has been associated with Messrs. Harrods, has now joined the staff of Young and Wildsmith, Ltd.

Mr. A. B. Black, of Falkirk, has been appointed manager of the Buckie (Banffshire) municipal electricity undertaking.

Mr. P. Nutter, A.M.I.E.E., has severed his connection with Messrs. Nutter, Son & Edge, Ltd., Manchester, and is recommencing in business under the title of P. Nutter & Sons, with temporary offices at 26, Manor Road, Southport. He asks for manufacturers' catalogues and lists.

Mr. J. Herrlein, who recently retired after 46 years' service with Standard Telephones & Cables, Ltd., was presented with a long-service medal at last week's dance of the company's Athletic and Social Club.

Lt.-Col. W. A. Vignoles has been elected a member of the Royal Institution of Great Britain. He was the guest of honour at a dinner given by the E.D.A. Council at the Savoy Hotel yesterday (Thursday) evening when a presentation was made to him on behalf of the members of the Association.

In connection with the county electrification scheme the Dumfriesshire County Council has fixed the salary of **Mr. C. R. Westlake**, county electrical engineer, at £650 per annum, rising by annual increments of £50 to £850 per annum. The following appointments have also been approved: **Mr. J. S. Pickles** to be deputy county electrical engineer, and **Mr. C. R. Bradley** to be engineer-draughtsman. Mr. Pickles has been in charge of overhead line construction for the Yorkshire Electric Power Co., and Mr. Bradley was with the Cargo Fleet Ironworks.

We reported in our last issue the inauguration of a supply to Congleton from the North-West Midlands Joint Electricity Authority. **Mr. C. H. Yeaman**, who is chairman of the Engineers' Committee of the Joint Authority, has sent us a photo-

graph (reproduced herewith) of a group taken upon the occasion. Mr. Yeaman is seen on the left of the picture, while the others, reading from left to right, are **Mr. Willcock,** resident engineer of Callender's Cable & Construction Co., Ltd., contractors for the overhead lines and underground cables, **Mr. Mills,** Mr. Yeaman's chief assistant; **Mr. Gurney,** resident engineer of the Metropolitan-Vickers Electrical Co.,

An Interesting Group at Congleton.

Ltd., which supplied the transformers and switchgear; and (on the right) **Alderman H. Leese,** chairman of the Joint Authority, by whom the supply was switched on.

Obituary.

Mr. C. E. Wilson.—Mr. Charles E. Wilson, A.M.I.E.E., a partner in the firm of Wilson & Herd, Ltd., electrical and mechanical engineers, of Johannesburg, and an electrical engineer who was well known in South African engineering circles, passed away at his home in Parktown, on February 1st. For the past year or two he had been in indifferent health and on his return from a recent visit to this country, undertaken for the purpose of placing his elder son in the factories of a British cable company, he became seriously ill and gradually sank. Mr. Wilson, who was born in Ireland, went out to South Africa in 1896 to carry out some important cable-laying contracts in connection with the inception of electricity supply in Durban and Maritzburg. In 1902 he went to the Rand to establish his business. He was one of the oldest members of the South African Institutes of Electrical and Mechanical Engineers.

Lt.-Col. C. R. Johnson.—We learn with feelings of deep regret that Lt.-Col. Charles Robert Johnson, for many years the secretary and a managing director of our contemporary *Engineering*, passed away on February 26th at the age of 71 years. Colonel Johnson had been connected with our contemporary for 52 years, having joined it in a junior post in 1879. He became a director in 1911 and a managing director in 1917. His great interest in life was the welfare of that journal, and we shall long remember the many courtesies that he was so ready to show to confrères engaged on the Electrical Review and other trade journals. He wished to continue to serve his renowned paper *Engineering* to the end, and this desire was realised, for he was at his office on the afternoon of February 25th in his usual good spirits and passed hence through a heart attack during the following night.

Sir Charles Parsons.—A memorial service for the late Sir Charles A. Parsons was held at Westminster Abbey on Tuesday last. The Dean of Westminster conducted the service and among those present were representatives of the Prime Minister and Mr. Stanley Baldwin, and of most of the scientific and engineering institutions, the Electricity Commission, the Central Electricity Board, and many industrial concerns. Memorial services were also held at Newcastle and Cambridge. The interment took place at Kirkwhelpington Church, Northumberland.

Mr. O. L. Falconar.—Mr. Oswald Lofthouse Falconar, who died during the week end, at Newcastle-upon-Tyne, served his apprenticeship with Messrs. J. H. Holmes & Co. In 1896 he founded Falconar, Cross & Co., electrical contractors, Newcastle, and became joint managing director. Mr. Falconar was an original member of the Electrical Contractors' Association and an associate member of the Institution of Electrical Engineers. He was 56 years of age.

Mr. W. N. Bower.—The funeral took place last week of Mr. Wm. Nelson Bower, consulting engineer, of Manchester and London. He was consultant to many large Lancashire firms, and was responsible for the electrification of some of the biggest mills in Lancashire. In his earlier days he had charge of engineering undertakings in Poland and India.

Mr. W. Curran.—The death occurred last week of Mr. William Curran, of the firm of Curran Brothers, electrical contractors, Belfast.

Lady Slingo.—We extend our sympathy to Sir William Slingo, who was engineer-in-chief of the General Post Office from 1912 to 1919, in the loss of his wife, Lady Slingo, who died suddenly on February 27th.

Mr. R. C. Bullough.—The death occurred on February 17th, at the age of 74 years, of Mr. Robert Crossley Bullough, who was the first general manager of the Colchester Corporation tramways, from which position he retired some years ago.

Mr. J. A. Blackwood.—We regret to hear of the sudden death of Mr. J. A. Blackwood who had been a director of Power & Lighting Cables, Ltd., for the past five years.

Will.—The late **Colonel Herbert Laws Webb** left £2,642 net and £3,412 gross personalty.

Financial Section.

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares.

New Companies Registered.

Power Holdings, Ltd.—Registered as a public company February 25th. Capital, £10,000 in £1 shares. Objects: To seek for and secure openings for the employment of capital in any part of the world, to finance, assist or participate in trading, financial, mercantile, industrial, manufacturing, mining and other businesses; to carry on business as exporters, importers, general and electrical engineers and contractors, suppliers of electricity, &c. The subscribers are: E. Rudland, 2, Bond Court, Walbrook, E.C.4, clerk, and six other clerks. The first directors are to be appointed by the subscribers. Not less than three-fourths of the directors (exclusive of alternate directors) must be British subjects. Solicitors: Linklaters & Paines, 2, Bond Court, Walbrook, E.C.4.

B. & S. Electrical Co., Ltd.—Private company. Registered February 25th. Capital, £1,000 in £1 shares. Objects: To carry on the business of electrical engineers and contractors, manufacturers and suppliers of all kinds of electrical apparatus, wireless apparatus, &c. The directors are: W. Bennison, 9, York Mansions, Earls Court, S.W.; E. S. Samson, 39, Church Street, Kensington, W.; Rhoda King, 164, Muswell Hill Road, N. The first two named are managing directors. Secretary: Rhoda King. Registered office: 28, Brewer Street, Westminster, W.1.

Hogan & Wardrop, Ltd.—Private company. Registered February 27th. Capital, £2,500 in £1 shares. Objects: To acquire the business of agents and merchants, carried on by Hogan & Wardrop, at 25, Old Street, E.C., and to carry on the business of electrical and mechanical engineers, &c. The directors are: E. J. Hogan, "Cotterbrook," Park Road, New Barnet, Herts, electrical engineer; F. Wardrop, 43, Coniston Road, Muswell Hill, N.10, electrical engineer; J. R. Hogan, address not stated. The first two named are permanent joint managing directors. Registered Office: 25, Old Street, E.C.1.

A. J. Dew & Co., Ltd.—Private company. Registered February 25th. Capital, £60,000 in £1 shares. Objects: To acquire the business of a motor and cycle accessory and radio goods wholesaler and/or merchant carried on by A. J. Dew, at 32, 33 and 34, Rathbone Place, Oxford Street, W., as "A. J. Dew & Co." The directors are: A. J. Dew, 33, Rathbone Place, W.1 (chairman and permanent director); Mrs. R. A. Dew, Burghfield, Berkhampsted, Herts. Solicitors: Engall & Crane, 28, Bedford Row, W.C.1.

Amalgamated Electric Lamp Manufacturers, Ltd.—Private company. Registered February 27th. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in electric, gas and oil lamps, quartz lamps, reflectors, globes, bells, fires, &c. The first directors are: A. E. Broomhall, Percivals Hotel, Worthing; E. A. Marshall, 19, Aspinall Road, Brockley, S.E.4; and A. D. Sanderson, Selsdon Park, near Croydon. Secretary: L. G. Simpson. Registered office: 618, Old Ford Road, E.3.

Power Installations, Ltd.—Private company. Registered February 27th. Capital, £1,000 in £1 shares. Objects: To carry on the business of electric lighting, heating, wireless, mechanical and general engineers, engineering contractors, &c. The subscribers are: P. H. Stone, 47, Temple Row, Birmingham, C.A.; C. A. Roberts, 24, Galton Road, Warley Woods, Smethwick, clerk. The first directors are to be appointed by the subscribers. Secretary (*pro tem*): C. A. Roberts.

Stokes Appliances, Ltd.—Private company. Registered February 27th. Capital, £5,000 in £1 shares. Objects: To acquire certain foreign and colonial patents granted to Lady Irene T. Stokes and A. G. Ionides in respect of an invention relating to an electric table cooker. The directors are: Lady Irene T. Stokes, 12a, Westminster Palace Gardens, S.W.1; A. G. Ionides, The Old Vicarage, Markyate, St. Albans, engineer; G. H. M. Thompson, Lastingham, York, engineer. Registered office: Chandos House, Buckingham Gate, S.W.1.

B. French, Ltd.—Private company. Registered February 26th. Capital, £5,000 in £1 shares. Objects: To carry on the business of electricians, electrical contractors, engineers, &c. The directors are: B. French, electrician (permanent chairman and managing director); and Mrs. L. French, "Summer Bank," Bewdley Hill, Kidderminster. Registered office: Mill Street, Kidderminster, Worcs.

Official Returns of Electrical Companies.

Charles H. Champion & Co., Ltd.—Debenture dated February 18th, 1931, to secure £7,110, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: London Tin Corporation, Ltd., 55/61, Moorgate, E.C.2.

Electrical and Radio Products, Ltd.—Particulars filed of £10,000 debentures authorised January 28th, 1931, charged on the company's undertaking and property, present and future, including uncalled capital and goodwill, the amount of the present issue being £5,000. Also issue on February 17th, 1931, of £1,000 debentures, part of a series already registered. (Both registered February 20th, 1931.)

Electrical and Chemical Ebonite Co., Ltd.—C. F. Palmer, 86/8, Queen Victoria Street, E.C.4, ceased to act as receiver on February 6th, 1931.

Biafone Co., Ltd.—Debenture dated February 16th, 1931, to secure £500, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: Mrs. E. B. T. Goddard, 62, High Street, Southwold.

Honiton and District Electric Supply Co., Ltd.—Satisfaction in full on February 7th, 1931 (1) of debentures authorised October 8th, 1913, and registered November 18th, 1913, securing £2,000, and (2) of debenture dated May 25th, 1920, and registered June 1st, 1920, securing £500.

Bourton-on-the-Water Electric Light and Power Co., Ltd.—Charge on electric light works and two freehold cottages adjoining in Sherborne Street, Bourton-on-the-Water, Glos., dated February 12th, 1931, to secure all moneys due or to become due from the company to Lloyds Bank, Ltd., not exceeding £300.

Grosvenor Engineers, Ltd.—Capital, £600 in 575 10 per cent. cumulative preference shares of £1 and 500 ordinary shares of 1s. each. Return dated December 17th, 1930. 500 preference and 500 ordinary shares taken up. £525 paid. Mortgages and charges, nil.

Indo-European Telegraph Co., Ltd.—Capital, £450,000 in £25 shares. Return dated July 24th (filed December 9th), 1930. 17,000 shares taken up. £425,000 paid. Mortgages and charges, nil.

Veritys, Ltd.—Capital, £196,000 in 7,000 5 per cent. preference and 7,000 6 per cent. preference shares of £10, 7,000 preferred ordinary shares of £7 10s., and 70,000 deferred ordinary shares of 1s. each. Return dated January 1st, 1931. All shares taken up. £137,701 10s. paid on 4,670 5 per cent. preference, 7,000 6 per cent. preference, 2,800 preferred ordinary and 30 deferred ordinary shares. £58,298 10s. considered as paid on 2,330 5 per cent. preference, 4,200 preferred ordinary and 69,970 deferred ordinary shares. Mortgages and charges: £101,698.

Highfield Electrical Co., Ltd.—Capital, £15,000 in 500 6 per cent. preference and 14,500 ordinary shares of £1 each. Return dated December 3rd, 1930. 11,350 ordinary shares taken up. £6,350 paid. £5,000 considered as paid. Mortgages and charges: £6,500 debenture.

Coatbridge and Airdrie Electric Supply Co., Ltd.—Capital, £200,000 in £1 shares. Return dated May 22nd (filed December 31st), 1930. 158,200 shares taken up. £157,200 paid. £1,000 considered as paid. Mortgages and charges, nil.

Berkeley & Young, Ltd.—Capital, £22,000 in £1 shares (subdivision not stated). Return dated January 6th, 1931. 6,276 shares issued as preference and 11,520 as ordinary. £7,786 paid on the preference and 1,510 ordinary shares. £10,010 considered as paid on 10,010 ordinary shares. Mortgages and charges, nil.

C.C.A. (Central Cables and Accessories), Ltd.—Capital, £3,000 in £1 shares. Return dated December 5th, 1930. All shares taken up. £3,000 paid. Mortgages and charges, nil.

Radioco, Ltd.—Capital, £2,500 in £1 shares. Return dated August 14th (filed December 8th), 1930. 2,200 shares taken up. £2,200 paid. Mortgages and charges, nil.

Pettigrew & Merriman (Continental), Ltd.—Capital, £3,000 in £1 shares. Return dated December 5th, 1930. All shares taken up. £3,000 paid. Mortgages and charges, nil.

Eastern Electric Sound System, Ltd.—Mortgage debenture dated January 27th, 1931, to secure £300 charged on the company's undertaking and property, present and future, including uncalled capital and goodwill. Also mortgage debenture of same date to secure any sum not exceeding £200 which the debenture holders may be called upon to pay to the company's bankers under a guarantee, charged on the above mentioned property. Holders: J. F. Tidswell and J. F. Tidswell, junior, both of 194, Chapeltown Road, Leeds.

E.J.C. Magnetos, Ltd.—Capital, £100 in £1 shares. Return dated October 22nd, 1930. Three shares taken up. £3 paid. Mortgages and charges, nil.

Fraser Mares, Ltd.—Capital, £1,500 in £1 shares. Return dated December 9th, 1930. 1,080 shares taken up. £1,080 paid. Mortgages and charges, £600.

Wireless Apparatus, Ltd.—Capital, £2,000 in 1,000 "A" shares of £1 and 8,000 "B" shares of 2s. 6d. Return dated November 14th, 1930. 100 "A" and 4,000 "B" shares taken up. £500 paid. £100 calls unpaid. Mortgages and charges, nil.

Bamford Works, Ltd.—Capital, £5,000 in £1 shares. Return dated September 4th, 1930. All shares taken up. £5,000 paid. Mortgages and charges, nil.

Chislehurst Electric Supply Co., Ltd.—Capital, £15,000 in £5 shares. Return dated May 14th (filed December 31st), 1930. All shares taken up. £15,000 paid. Mortgages and charges, nil.

Durham & District Electric Traction Co., Ltd.—Capital, £30,000 in £1 shares. Return dated August 5th, 1930 (filed January 7th, 1931). Seven shares taken up. £7 paid. Mortgages and charges, nil.

British Lighting & Ignition Co., Ltd.—Capital, £100 in £1 shares. Return dated October 22nd, 1930. Three shares taken up. £3 paid. Mortgages and charges, nil.

Pole-Barn Wireless Works, Ltd.—Capital, £1,005 in £1 shares. Return dated November 17th, 1930. 1,001 shares taken up. £1 paid. £1,000 considered as paid. Mortgages and charges, nil.

City Notes.

Midland Counties Electric Supply Co., Ltd.

The report of this company was abstracted in our last issue, p. 390, and the annual meeting was held on March 2nd, Mr. G. Balfour (chairman) presiding. In the course of his speech the chairman said the policy of remodelling their traction systems and of extending their electricity services with the greatest possible speed until all their territory was served had been fully justified by the events. Their transmission lines now reached the boundary of the power companies' territories in all important directions, and had made possible supplies in a large number of rural districts. During the year they had changed over two of the traction undertakings to 'bus operation, and the remaining traction properties were in course of change-over to trolley vehicles or 'buses. During the year they had expended £460,000 on extensions, and had laid and erected 154 route-miles of h.p. lines. In addition, they had laid 133 miles of l.p. distributors. This brought the total up to 900 miles for h.p. lines and 731 miles of l.p. mains. The h.p. and l.p. cables laid or erected averaged 5¼ miles per week throughout the year. Supplies were inaugurated in one urban district and 68 parishes, bringing the total number of districts supplied up to three boroughs, 28 urban districts, and 247 parishes, and in addition contracts were entered into for the

public lighting of a number of districts. The number of consumers connected during the year was 7,072, making a total of 33,253. The output of electricity increased by 9 million kWh to 174,500,000 kWh. They were installing an additional 30,000-kW turbo-generator, together with the necessary boiler-house equipment, at the Spondon station. Regarding the current year, the consumption of electricity for the first two months continued to show a satisfactory increase, and assuming that trade conditions were no worse than at the present moment, they would be able to record a satisfactory growth of business during the current year. The report and accounts were adopted.

The " Underground " Group.

The financial results of these companies were briefly reviewed in our issue of February 20th, p. 342. On February 26th the combined annual meeting of shareholders was held, Lord Ashfield, the chairman, presiding. Addressing the meeting, the chairman said that the companies associated together in the common fund, carried 1,960 millions of passengers in 1930, or 117 millions more than in 1929, representing an increase of nearly 6 per cent., due in large part to the consolidation of certain subsidiary omnibus companies with the L.G.O.C. The car mileage also increased from 245 millions to 256 millions, or by 4 per cent. All the other undertakings carried 626 millions of passengers, a decrease over 1929 of 50 millions, due to the transfer of certain subsidiaries to, and their consolidation with, the L.G.O.C., so that their present share in the aggregate passenger movement of Greater London was 2,586 millions, or 63 per cent. Reviewing the progress made during the past 10 years, the chairman said that in 1921 the aggregate capital of the companies was about £49,000,000, and in 1930 it was £77,000,000. This did not represent the whole of the money spent upon improvements and expansion, for further sums had been spent out of reserves and current revenue. Already £31,000,000 had been spent, and in addition, commitments had been incurred amounting to £14,000,000 more. With this expenditure they had added a fifth to the railway mileage and two-thirds to their fleet of public service vehicles, and when their present commitments were completed they would have added almost another fifth to their railway mileage. They had in mind the promotion of a Bill which would enable them to build an extension of the Bakerloo section from the Elephant and Castle to Camberwell Green, a distance of 1¾ miles, at a gross cost of £1,875,000. Regarding the co-ordination of London traffic, so long as the Minister of Transport's scheme provided for the continued progress and expansion of the undertakings to serve the public, for enterprise and skill in management, for the security and welfare of the staffs who they employed, and at the same time afforded the shareholders a fair exchange for their stocks and shares, it would be their duty to assist and help him at every point. The report and accounts were adopted.

Charing Cross Electricity Supply Co., Ltd.

The directors' report for the year ended December 31st, 1930, shows that the West-End undertakings had gross earnings of £370,599, as compared with £349,127 in the preceding year. Expenses totalled £218,914 (against £214,580), leaving £151,685 to which is added £87,584 brought in and interest and dividends accrued of £50,768, making a total of £290,037. After deducting debenture interest, &c., it is proposed to pay a final dividend of 10 1-16d. per share on the ordinary shares, making the standard dividend for the year, to transfer £24,076 to reserve for shareholders' proportion of consumers' benefit, and to appropriate £5,129 to co-partners, leaving £93,301 to be carried forward. The connections totalled 40,093 kW, and the sales of electricity 36,360,814 kWh.

The City undertaking's accounts show gross earnings of £368,592 (against £364,376), and a net income of £145,485 (£124,892). To this is added rent in respect of Bow generating station and trunk mains, &c., of £60,944, making a total of £206,429. After providing for debenture interest, &c., the preference dividend, and a dividend on the ordinary shares equivalent to 10 per cent. on £350,000 and 7 per cent. on £200,000 are paid, leaving £31,021, of which it is proposed to transfer £24,889 to reserve for shareholders' proportion of consumers' benefit, and to appropriate £6,132 to co-partners. The total connections to the City mains are now 44,428 kW, and the electrical energy sold was 42,835,978 kWh. Meeting: March 11th.

North Metropolitan Electric Power Supply Co.

The annual meeting was held on February 24th, Lord Ashfield (chairman and managing director) presiding. In presenting the report and accounts (*vide* Elec. Rev., February 20th, p. 342), the chairman referred with regret to the death of Mr. E. Garcke, one of the original directors of the company, and said the vacancy on the board had been filled by the appointment of Sir Ernest Clark. Regarding the past year, the sales of electricity amounted to 228,600,000 kWh, which represented an increase of nearly 29,000,000 kWh, as compared with the previous year. The number of consumers supplied either directly or indirectly at the end of the year showed an increase of 18 per cent. and reached a total of 138,000. Of this number, 72,350 consumers were being supplied direct by the company, this figure representing an increase of 23 per cent. as compared with 1929. In addition to the substantial reduction in rates introduced as from March, 1930, further reductions in a number of districts had been made to take effect from the beginning of the current year. The average price per kWh received from consumers on the contract rate was approximately one-third of the average on the lighting rate, and the number of consumers on this rate increased by 50 per cent., as compared with the preceding year. Under their scheme of hire-purchase of wiring and apparatus, the sales effected during the year had a total value of £58,000. They had received a notice from Edmonton Urban District Council of its intention to purchase the undertaking established under the Edmonton Electric Lighting Order. The report and accounts were adopted.

Westminster Electric Supply Corporation, Ltd.

The annual meeting was held on February 24th, Lord Wargrave (chairman) presiding. In presenting the report and accounts (Elec. Rev., February 20th, p. 343), the chairman said that the output increased by more than 8,500,000 kWh, making a total of 80,250,000 kWh sold during the year, with an increase in revenue of £59,600. The average price paid by consumers was lower by 0.06d. per kWh than in 1929. As to the future of the undertaking, he would remind the shareholders that the sliding-scale arrangements in regard to the standard dividends and standard prices were due for revision as from the end of 1931. The standard dividend as from January 1st, 1932, would be at the rate of 7 per cent. on the ordinary share capital, including any additional shares created by means of capitalising the special reserve fund. New standard prices would have to be fixed to operate as from the same date, and they would be based on the figures contained in the accounts for either one of the years 1930 or 1931 at the option of the company. The report and accounts were adopted.

St. James' & Pall Mall Electric Light Co., Ltd.

The accounts of this company were abstracted in our issue of February 20th, p. 343, and the annual meeting was held on February 24th. In the course of his speech the Earl of Balfour (chairman), who presided, said they had expended during the year £105,766, the principal items comprising machinery and fixed plant and mains required for the change-over from d.c. to a.c. They had been successful in negotiating on long leases further sites for sub-stations, and had now, they believed, obtained all the sites necessary to meet their requirements for the next few years. The work of change-over had steadily progressed, and by the end of 1930 they had connected 14,846 kW to the a.c. system. This was equivalent to 36.83 per cent. of the total connections to date. The electrical energy sold during 1930 showed an increase of 5.29 per cent. as compared with 1929, while connections also showed a satisfactory advance from 38,609 to 41,637 kW. Their average over-all return was 1.958d. per kWh, as compared with 2.054d. in the preceding year. The report and accounts were adopted.

Telephone & General Trust, Ltd.

Presiding at the annual meeting on February 26th, Sir Alexander Roger (chairman), in the course of his speech, said that a valuation of the Trust's investments made at December 31st last showed the valuation to be in excess of the figure shown in the balance-sheet. The investment list continued to grow, and the geographical distribution was now as follows:—British Empire, 34.86 per cent.; Europe, 16.09 per cent.; South America, 25.04 per cent.; U.S.A., 24.01 per cent. The subsidiary companies were progressing, and all of them showed profits. They had reviewed in detail the auxiliary services given by the Trust to its subsidiary and associated companies, and had decided that the volume of this work had now reached a stage when these services should be segregated from the investment business. The board had therefore formed a new subsidiary with the title " Telephone and Associated Services, Ltd.," which would take over those services from the Trust as from March 1st. The report and accounts were adopted.

Northampton Electric Light & Power Co., Ltd.

Presiding at the annual meeting on February 27th, Mr. F. H. Thornton (chairman), in the course of his speech, said that the sales of electricity for the year under review had risen by 5,360,934 to 38,310,015 kWh, an increase of 16 per cent. The average price obtained per kWh sold had for many years past shown a steady reduction year by year and the average price in 1930 was 1.36d. per kWh. H.p. transmission lines had been extended by 53 miles, making a total of 268 miles, and the l.p. mains by 38 miles, making a total of 201 miles. By pushing into the rural areas with their h.p. transmission lines they, in conjunction with their associated companies, were now supplying electricity, or were constructing mains to give a supply, to 14 towns and urban districts and 177 villages. By arrangement with H.M. Treasury under the Development (Loan Guarantees and Grants) Act, 1929, they were carrying out certain work in the rural area amounting in value to £64,000. The assistance given had enabled them to supply about 50 villages which would not otherwise have been supplied for some years to come. The board had decided to issue the remaining 77,500 ordinary shares to the ordinary shareholders, on a *pro rata* basis, and the price had been fixed at 32s. 6d. per share. The issue would be made immediately. The report and accounts were adopted.

London Electric Supply Corporation, Ltd.

The report for the year ended December 31st last shows a profit of £194,858, as compared with £171,833 in the preceding year. To this is added £42,688 brought forward and interest from investments, &c., of £48,693. After deducting interest charges and sinking fund instalments, a balance of £224,698 is available (against £186,721). The final ordinary dividend is 5 per cent., making 9 per cent. for the year (same); £58,000 is transferred to ordinary shareholders' benefit (sliding scale) fund; £7,016 is appropriated for co-partners' benefit (sliding scale); and £54,793 is carried forward. The sales of electricity increased from 248,144,007 to 263,519,650 kWh.

Kensington and Knightsbridge Electric Lighting Co., Ltd.

The report for 1930, which is to be presented at the annual meeting on March 12th, records a net profit of £45,002 (against £36,650 in 1929). To this £2,123 brought forward is added, making £47,125. After meeting the interim preference and ordinary dividends, £31,844 remains, with which it is proposed to deal as follows:—Payment of remainder of preference dividends, £1,125; final dividend on the ordinary shares (10.1811d. per share, making up the standard dividend for the year), £13,469; transfer to special reserve, £11,113; appropriation to co-partners, £4,226; carried forward, £911. The sale of energy increased by 19.7 per cent. to 23,332,420 kWh, and the connected load by 13.1 per cent. to 41,278 kW.

National Gas Engine Co., Ltd.

The net profit for the past year amounted to £17,923 (against £76,620 in 1929), to which is added £23,969 brought forward, making £41,892. It is proposed to pay a final dividend on the preference shares at the rate of 5 per cent. per annum (less income tax), leaving £29,892 to be carried forward. In view of the present unsatisfactory state of trade, the directors do not consider it advisable to recommend payment of a dividend on the ordinary shares.

Enfield Cable Works, Ltd.

The accounts for the year ended December 31st last show a profit of £173,718, as compared with £142,026 in 1929, to which is added £33,559 brought in, making £207,277. After deducting depreciation, &c., it is proposed to pay a final dividend of 15 per cent., making 25 per cent. for the year, to transfer £40,000 to reserve and to place £5,000 to income tax reserve, leaving £34,333 to be carried forward. The distribution is the same as for the previous year, but on increased capital, an issue of 50,000 ordinary £1 shares having been made in March last. The report records the death of Mr. D. Sinclair, a director. Meeting: March 9th.

Hydro-Electric Securities Corporation.

The report for 1930 shows a gross income of $7,497,750, to which is added $6,063,552 brought forward, making $13,561,303. After deducting general expenses, &c., and allowing for the dividend of $2 per share on the common shares (against $1 in 1929), there is a surplus of $9,342,472. The report gives a list of the company's investments, which include holdings in the Clyde Valley Electrical Power Co., and the County of London Electric Supply Co.

Liverpool Overhead Railway.

The total receipts for the past year were £86,528, and the surplus on the year's working was £8,304. After meeting debenture interest and adding the balance brought forward, there is a balance of £7,172 to the credit of the revenue account. For 1929 the preference shares received a dividend of 5 per cent.

Companies Struck Off the Register.

The names of the undermentioned companies have been struck off the Register and such companies are thereby dissolved:—

Mica Insulators, Ltd.
Wareham Electricity Supply Co. (1928), Ltd.

Shawinigan Water & Power Co.

The gross revenue for 1930 amounted to $14,954,074, as compared with $13,475,862 in 1929, and the net revenue, after providing for depreciation to $5,770,671, as against $5,107,979. It is proposed to pay a dividend at the rate of $2.50 per share, which leaves a balance of $325,046. To this is added $1,010,346, balance brought in, making the total balance to be carried forward $1,335,392 (subject to income tax).

City of London Electric Lighting Co., Ltd.

The directors have recommended a final dividend of 1s. per share on the ordinary shares, making the standard dividend of 10 per cent. for the year. Special reserve receives £67,086, and a balance of £10,183 is carried forward.

Metropolitan Electric Supply Co., Ltd.

The report for 1930 shows a gross revenue of £1,113,240 and expenditure of £704,570, leaving a net revenue of £408,670. After deducting interest, sinking fund charges, &c., a dividend is paid of 10 per cent. on the ordinary shares, leaving £111,062 to be carried forward. The total connections increased by 23,838 to 196,478 kWh. It is proposed to increase the capital to £3,000,000 by the creation of 500,000 additional ordinary shares of £1 each. An offer is being made for the 250,000 ordinary shares of the Egham & Staines Electricity Co., one Metropolitan £1 ordinary share being offered in exchange for one £1 ordinary share of the Egham Company. The offer expires on March 9th and is conditional upon acceptance by holders of 90 per cent. of the shares. Meeting: March 10th.

Isle of Thanet Electric Supply Co., Ltd.

The total revenue for 1930 amounted to £177,615, and after deducting expenses, debenture interest, transferring £30,000 to general reserve and depreciation account, &c., there remains £23,345, to which is added £8,358 brought forward, making £31,702. A dividend of 4 per cent. on the ordinary shares is proposed, leaving £8,783 to be carried forward.

Richmond (Surrey) Electric Light & Power Co., Ltd.

A final dividend is announced of 7 per cent. on the ordinary shares, making 11 per cent. for 1930 (same).

Marconi International Marine Communication Co., Ltd.

A final dividend is recommended of 10 per cent. (less tax), making 15 per cent. for the year (same).

British Columbia Power Corporation.

A dividend is announced of 50 cents per share on class "A" shares for the quarter ending March 31st.

Allgemeine Elektrizitäts Gesellschaft.

The Berlin correspondent of the *Financial Times* reports that at the general meeting on February 26th the balance-sheet for 1929-30 and the proposed dividend of 7 per cent. (against 9 per cent.) on the Rm.200,000,000 (£10,000,000) capital were unanimously adopted. Geheimrat Bücher (chairman of the company) said that the decrease in turnover of Rm.60,000,000 (£3,000,000) to Rm.520,000,000 (£26,000,000) corresponded to a 20 per cent. reduction in orders. Of the orders received, 43 per cent. came from abroad. In the current year orders from abroad had increased by about 8 per cent., whereas home orders had fallen away by about 40 per cent. The number of employés last year was reduced from 60,000 to 51,000. On February 16th a five-day week was introduced by the company. It was hoped that this would obviate discharges on a large scale, and in some departments it had already led to further workers being engaged.

Stocks and Shares.

TUESDAY EVENING.

THE lifting of the clouds of industrial depression in the United States, mention of which was made here last week, is said to be spreading to the Eastern hemisphere. At any rate, a slightly more cheerful feeling crept into the Stock Exchange markets, and this in spite of the Government's obvious difficulties in connection with the forthcoming Budget, and the continuance of the present reckless extravagance on the part of the spending departments. The Stock Exchange securities more particularly connected with money—that is to say, gilt-edged stocks and shares—show a firmer tendency that is reflected in moderate improvements. London Power debentures hardened to 1¼ premium. The 4½ per cent. debenture stocks of the Electricity Board are both 1¼ up, at 94.

Egham & Staines Terms.

The reason for the jerky rises which lifted the price of Egham & Staines to well over 40s. not long ago is now revealed in the offer made by the Metropolitan Company to buy the Egham & Staines by giving one Metropolitan share in exchange for one Egham ordinary. The shareholders in the Egham & Staines Company are to receive, under this proposal, any dividend up to 7½ per cent. to be declared in respect of their holdings for the current year. Optimism had looked for something like 45s. to be paid for the shares. Metropolitans stand at 41s. 3d., so that the bid may be described as very satisfactory from the point of view of all except those who anticipated exaggerated terms. The effect has been to put up the price of Egham shares to the neighbourhood of 40s., and dealings have naturally become more or less a matter of negotiation. The chairman of the Egham & Staines Company is to receive £8,000 for compensation for loss of office, and the other directors are to divide £3,000 compensation amongst them.

Home Electricity Supply.

Metropolitans were unchanged on news of the proposed acquisition. The price had previously slipped back a trifle, and shows a loss of 9d. on the week at 2 1/16, possibly because the dividend is to be maintained at 10 per cent. for last year, instead of being increased, as some people had hinted would be the case. London Electrics are a little harder at 33s. The company's profits for 1930 show an increase of £23,000. The

dividend remains the same. The Charing Cross and the City of London companies, in their dividend statements, confirm the previously expressed opinion that the amounts would be maintained at the standard rate. The companies have both done very well in the matter of increased business. Yorkshire Electrics, at 32s. 6d., are 1/16 down. Northampton Electric ordinary have fallen 2s., to 42s., on the company's announcement of its intention to issue 77,500 ordinary shares to existing ordinary shareholders on a *pro rata* basis at 32s. 6d. per share.

Australian Companies.

Some of the shareholders in the Melbourne Electric Supply Company and in the Adelaide Electric Supply Company resent the intention of the Board to pay dividends on the preference shares in both undertakings in such manner as will mulct the British proprietor in the expense involved by the Australian exchange. It may be recalled that both companies were transferred from London to Australia some ten years ago. The directors state that they are prepared to facilitate, so far as lies in their power, the hearing of any proceedings instituted, and it would seem as though the directors and shareholders are equally anxious to get a clear ruling on what is, after all, a very important matter from the point of view of anyone who holds shares in Australian companies. Meanwhile, the price of Melbourne Electric ordinary stock is quoted at 115, the 8 per cent. preference shares of £5 each stand at 82s. 6d., and the 5 per cent. first mortgage debenture stock at 90. The three classes of Adelaide Supply preference stocks are all quoted nominally at the same figure of 75, the 5 per cent. mortgage debenture stock at 93, and the 5½ per cent. redeemable debenture stock at 88. In the Indian group, the new Calcutta Electric ordinary shares retain their strength at 6s. 6d. premium, the senior issue going back a trifle to 39s. 3d.

Cables & Wireless.

Substantial rises have taken place in the three issues of the Cables & Wireless group. Following on the rally which occurred last week, the stocks spurted still further on very interesting rumours as to the possibility of the combine entering into agreement, in some shape or other, with the International Telephone & Telegraph Company, *via* our own Post Office. The rumour is mentioned for what it may be worth, which possibly is nothing at all, but the character of the recent buying has been sufficiently significant to invest the report with at least more than a shade of probability. The last-published traffic figures were poor, but, instead of going back, the prices spurted almost immediately afterwards, and, as may be imagined, expectation stands on the tiptoe of curiosity for the announcement of some development that will account for the violent rise in the prices of the stocks. The Telephone & General Trust has formed a subsidiary company, which came into operation on Sunday last, and is called the Telephone & Associated Services. The new company will take over the activities which may be described as "service," while the old company will assume more the aspect of an investment trust.

Anglo-American Telegraph deferred stock is a little better, and, in sympathy with the Cables & Wireless rises, Globe Telegraph & Trust ordinary advanced to 12. Canadian Marconi are a few pence easier at 15s. International Telephone and Telegraph, at 34½, have lost part of their 5 points gain of last week, and American Telephone & Telegraph, at 202¼, shows a fall of 1¼. Eastern Telegraph 3½ per cent. debenture is lower at 65, and Eastern Extension debenture drooped to 78¼.

The Undergrounds.

Recoveries in the stocks of the Metropolitan and of the District companies have raised the prices by 2 and 1 to 56½ and 73¼, respectively. Underground Electric ordinary are a trifle better at 28s. 6d. The general condition of the Home Railway market has assumed a brighter aspect, the argument being apparently that prices can scarcely go much lower, and that any change must perforce be for the better. The improvement has extended to the prior charge stocks, District rentcharge, for instance, being up a point to 79½. Underground Electric 6 per cent. income bonds, of which there was but £414,000 left out of the original 6¼ million pounds, have been paid off this week.

British Electric Traction deferred has recovered the 75 points which the price lost a week ago.

Manufacturing and Equipment.

Shares in the group of manufacturing and equipment companies experienced difficulty in rallying from the heaviness which recently overtook them. There has been little recovery from the low prices reached a week ago. Enfield Cable shares, however, are 1/16 better at 4 5/16. The company has declared a final dividend of 15 per cent., less tax, making 25 per cent. for the year, the same as that of the corresponding period. G.E.C. ordinary strengthened to 45s. 6d. Associated Electrical Industries are a shade harder. On the other hand, Henleys eased off to 5⅛. British Aluminium ordinary fell back to 29s., the preference to 20s. 9d. English Electric ordinary and preference are both weak at 6s. 3d., showing falls of 1/16 in each case. India-Rubber shares gave way to 5s. British Thomson-Houston preference at 23s. 9d. are a few pence lower. Iron, steel, and allied shares have risen, Vickers to 7s. bid. Babcocks are better at 48s. 9d. Rubber shares enjoyed a violent spurt, on a jump in the price of the raw product.

Share List of Electrical Companies.

Home Electricity Companies.

	Nom.	Approx. Dividend. 1928.	1929.	Price March 3 1931.	Rise or fall.	Yield p.c.
	£					
Bournemouth and Poole	1	15	15	3	—	5 0 0
Brompton Ordinary	1	8½	8½	28/-	—	5 0 0
Central Electricity 4½% Deb. ...	Stock	—	—	94	+1½	4 15 9
Charing Cross Ordinary	1	8½	8½	29/-	—	4 16 7
Chelsea	1	8¾	8¾	28/-	—	5 0 0
City of London	1	10	10	36/3	—	5 10 3
Clyde Valley	1	8	8	33/9	—	4 14 10
County of London	1	7	10	46/3	—	4 6 7
Edmundsons' 7% Pref.	1	7	7	25/6	—	5 9 10
Elec. Supply Corporation	1	11	11	47/6	—	4 12 7
Kensington Ordinary	1	8	8	29/-	—	4 16 7
Lancs. Light and Power	1	7½	7	23/-	—	6 1 9
London & Home Counties 4½% Deb.	Stock	—	—	94	+1½	4 15 9
London Electric	1	8½	9	33/-	+6d.	5 9 1
Metropolitan	1	9	10	41/3	—9d.	4 17 1
Midland Counties	1	6½	7	27/6	—	5 1 10
Mid. Elec. Power	1	15	8	31/3	—	5 2 5
Newcastle-on-Tyne Ordinary ...	1	6	6	23/6	—	5 6 8
do. 7% Pref.	1	7	7	27/6	—	5 1 10
Notting Hill 6% Pref.	10	6	6	11½	—	5 6 8
North Met. Elec. 6% Pref. ...	1	6	6	24/-	—	5 0 0
St. James' and Pall Mall	1	8	8	28/6	—	4 18 3
Scottish Power	1	8	8	29/6	—	5 8 6
South London	1	8¼	8½	28/-	—	5 0 0
Urban Ordinary	1	7	7	28/9	—9d.	4 17 5
Westminster Ordinary	1	8¼	8½	29/-	—	4 16 7
Whitehall Elec. Invst. 7½% Pref....	1	7½	7½	25/6	—	5 17 8
Yorkshire Elec.	1	8	8	32/6xd	—⅞	4 18 6

Home Rails.

Central London Ord. Assented ...	Stock	4	4	80	—	5 0 0
Metropolitan	,,	3½	4	56½	+2	6 4 0
do. District	,	4	5	73¼	+1	6 16 0
Underground Electric	£1	7	8	28/6	+6d.	6 16 0

Telegraphs and Telephones.

Anglo-Am. Tel. Pref.	Stock	6	6	106½	—	5 16 0
do. Def.	,,	1½	1½	26½	+½	5 16 6
Automatic Telephone	1	10	12½	37/6	—	6 13 4
Cables & Wireless 5½% Pref. ...	Stock	—	5½	77	+5	7 2 10
do. A 7½% Ord.	,,	—	—	24½	+3½	... ...
do. B Ord.	,,	—	—	18	+1	... ...
Globe Tel. and T. Ord.	10	10	10	12	+½	8 6 8
do. do. Pref.	10	6	6	10½	—	5 14 2
Great Northern Tel.	10	20	20	29½	—	6 15 7
Marconi-Marine	1	12½	15	37/6	—	8 0 0
Oriental Telephone Ord.	1	12	12	28	—	*5 1 0

Home and Foreign Trams, &c

Anglo-Arg. Trams First Pref. ...	5	5½	5½	1	—	... ...
do. do. 2nd Pref. ...	5	6	6	12/6	—	... ...
do. do. 5% Deb. ...	Stock	5	5	42½	+5	11 15 2
British Electric Traction Def. Ord.	,,	5	5	1300	+75	... ...
do. do. Pref. Ord.	,,		8	182½	—	5 19 0
Brazil Traction	100	7	8	27½	—½	... ...
Brit. Columbia Elec. Rly. Pcc. ...	Stock	5	5	97½	—	5 2 7
London & Sub. Trac. 5% Pref. ...	1	Nil	Nil	10/6	—6d.	... ...
London United Tram Deb. ...	Stock	4	4	60½	—	6 12 4
Mexico Trams, 5% Bonds ...	—	5	5	51½	—1	9 14 2
Mexican Light Common	100	Nil	Nil	48½	—	... ...
do. 7% Pref.	100	7	7	67½	—	10 7 4
do. 1st Bonds	—	5	5	78	—	6 8 0
Victoria Falls Ord.	1	15	15	58/9	—	5 2 0
Yorkshire (West Riding)		Nil	Nil	5/6	—	... ...

Manufacturing Companies.

Assoc. Elec. Ord.	1	6	6	21/6	+1d.	5 11 7
Babcock & Wilcox	1	13	15	48/9	+9d.	*6 3 0
British Aluminium Ord.	1	10	10	29/-	—6d.	6 18 0
British Insulated Ord.	1	15	15	3½	—	4 16 0
Brush Ord.	Stock	10	10	105	—	9 10 6
Callenders	1	15	15	3	—	5 0 0
do. 6½% Pref. ...	1	6½	5½	25/-	—	5 4 0
Crompton Parkinson Ord.	5/-	—	30	23/-	—3d.	6 10 9
do. 8% Pref.	1	8	8	28/-	—	5 14 5
Edison-Swan 1st Pref.	1	7½	7½	23/9	—	6 6 4
do. 5% Deb.	Stock	5	5	94½	—	5 5 10
Electric Construction	1	5½	5	11/9	—3d.	8 10 2
Enfield Cable Ord.	1	20	25	4 5/16	+1/16	5 16 0
English Electric	1	Nil	Nil	6/3	—	... ...
do. Pref.	1	3	Nil	6/3	—	... ...
Ferranti Pref.	1	7	7	21/6	—	6 10 4
G.E.C. Pref.	1	6½	6½	25/6	—	5 2 0
do. Ord.	1	10	14	45/6	+6d.	6 8 1
Henley	1	25	30	5⅛	—⅛	5 6 8
do. 4½% Pref.	5	4½	4½	4⅜	—	5 2 10
India-Rubber	1	Nil	Nil	5/-	—⅛	... ...
Johnson & Phillips	1	10	10	36/9	—	5 8 10
Siemens Ord.	1	7½	7½	1 5/16	—	7 1 2
Telegraph Construction	12	10	10	16½	—	*7 5 6

*Dividends paid free of Income Tax.

Continental Electrical Markets.

The Prospects for British Manufacturers in Italy and Portugal.

THE Department of Overseas Trade in its endeavours to provide information regarding the possibilities of increasing the sale of British productions in foreign markets recently addressed a questionnaire to its officers in various overseas countries. From the answers received, special reports have been drawn up with regard to trade possibilities in electrical goods from which we have been permitted to draw the information on which the following article is based. Reviews of two similar reports dealing with the French and Spanish markets appeared in our issue of October 17th last.

A Showroom in Piacenza, Italy.

The Situation in Italy.

Although electric power supply is nowadays available in every town and practically every village in Italy and Sicily, the rates at present charged are in many instances too high to encourage the use of domestic electrical appliances. Hence, it is only in the larger cities and towns, as for example Rome, Milan, Turin, and Genoa, that such articles as electric irons, fans, and radiators have come into extensive use during the last few years. Even in the places named, other appliances such as ranges, hotplates, toasters, boilers, &c., are only in limited use, while in the smaller towns and country villages they are practically unknown. While there is thus a good deal of spade work to be done, supply undertakings recognise that tariffs must be reduced and there is a general tendency to introduce lower rates for power used for domestic purposes other than lighting. Moreover, the recent abolition of taxation—national and municipal—on the consumption of electric power for domestic purposes is expected to result in a bigger demand.

As already indicated, sales are largest of the smaller type of electrical appliance. The use of vacuum cleaners is as yet not extensive, being confined chiefly to large hotels and to the more wealthy residents in Rome and the Northern Italian towns, one reason being that carpets, as they are known in this country, are not in general use in Italy. Moreover, owing to the fact that ice is plentiful and cheap there is only a limited demand for electrical refrigerators. One city in particular where there is a growing interest in domestic electrical appliances is Turin, where not only is there a low tariff in operation, but two power supply undertakings—one municipal and one private—maintain large showrooms in which they offer to display and demonstrate appliances free of charge. At present only one British firm is represented in these showrooms, particulars of which can be obtained from the Azienda Elettrica Municipali, 48, Via Bertola, Turin, and the Societa Idroelettrica Piemontese, 40, Via Bertola, Turin. The activities of the last-mentioned concern are not restricted to Turin, but extend all over Northern Italy.

In Milan the demand has not so far been greatly developed but is regarded as promising. On the other hand, in Venice not only is competition very keen for what trade there is, but power supply charges are high. A similar state of things is reported as regards Trieste, while with respect to Florence irregular electricity supplies and cheap gas are deterrent factors. A limited trade is done in the Leghorn area, where the supply company, La Società Toscana di Elettricità, also engages in the sale of appliances, but considers the price of British products to be prohibitive. On the other hand, Rome has the advantage of low charges for power and is regarded as a promising market. In Sicily the only town in which there are prospects of business is Palermo, where the local supply concern, the Compagnia Generale Elettrica della Sicilia, despite relatively high charges for power, has lately inaugurated a campaign to popularise the use of domestic electrical appliances.

Summarising the general information regarding Italy, it is noted that the voltages range from 110 to 130, 140 to 160, and 220 to 250. Appliances are generally supplied ready for use with suitable plugs and lengths of flex and are guaranteed against defective material or workmanship for twelve months. Packing usually consists of cardboard boxes, although in some cases wooden cases covered with artificial leather and provided with attractive linings are used. Dealers, who are required to keep a stock of replacement parts, receive a discount off makers' list price of from 25 to 50 per cent. Many of the vacuum cleaners are sold on the hire-purchase plan.

In 1929, the last year for which particulars are available, the Italian imports of hotel and domestic electrical appliances attained a value of about £902,200, as compared with £889,900 in 1928. Of the trade that is being done it is estimated that 50 per cent. is secured by Italian manufacturers, of which there are at least six different concerns. Although the Italian-made articles are low in price, the quality is said to leave room for improvement. The remaining 50 per cent. is divided between Swiss, German, Swedish, and American makers, Switzerland and Germany supplying the smaller appliances, Sweden vacuum cleaners, and the United States both cleaners and refrigerators. Unfortunately, the report states, imports from Great Britain are practically negligible, British goods being completely unknown in most cities.

Taking the Italian market as a whole, it is felt that the prospects for British manufacturers are not good unless they are able to sell at competitive prices and are also prepared to give specially favourable terms to agents and dealers in the way of long credits and to place goods on consignment until they have become known. Advertising and other forms of propaganda in favour of British appliances would also be necessary. In Italy imported domestic electrical appliances are subject to import duties on a weight basis (100 kg.), the rate varying in accordance with the particular goods; in addition they are subject to a sales tax of 1½ per cent.

A Well-appointed Italian Showroom.

We reproduce herewith photographs showing the interior of the attractive showroom in Rome of the Azienda Elettrica del Governatorato, and a view of the Piacenza showroom of the Società Brioschi per Imprese Elettriche.

The Limited Scope in Portugal.

It is not possible to give any idea of the extent of the trade that is being done in domestic electrical appliances in Portugal, as the only item separately mentioned in the official import

returns is that of electric irons, the value of the imports of which in 1929 amounted to only £1,118, as against £1,438 in the previous year. Of this total £806 is credited to Germany, France being second with £179 and Gt. Britain third with only £18. One deterrent to any great increase in the demand is that during the past year the price of electricity has been increased by 20 per cent. and for domestic use the cost now averages about 5d. per kWh. Hence it is that the Portuguese people think twice before purchasing any domestic electrical appliances other than those which are regarded as necessary such as fans, and to a lesser extent irons, radiators, and fires. At the same time there are signs of progress, especially in Lisbon and Oporto, in which cities the use of electricity is most widespread. It is these two places which present the best opportunities for sales of domestic appliances. The pressures in use in the Lisbon district are 190 and 110 V, and in the Oporto area 380 and 220 V.

So far there is no manufacture of appliances carried on in Portugal. Although four French firms are represented in the country, what trade is being done is mainly by German manufacturers, the only exceptional line being electric fans, the demand for which is growing and is chiefly supplied from Italy. One well-known German house has its own (German) representative on the spot carrying a considerable stock from which he supplies the retail trade and in some cases the public direct. Another prominent German concern also keeps a stock in Portugal, but its representative also handles certain nationally-manufactured electrical goods such as switches, sockets, tubing, and porcelain insulators. According to the report there are to all intents and purposes no articles of British manufacture to be found in the Portuguese market.

For the immediate future there are no prospects for the sale of electric ranges owing to their high cost, the price of energy and to their working being beyond the standard of knowledge and competency of the average Portuguese servant. Although used to a slight extent, there is not likely to be a large demand for vacuum cleaners nor for water heaters, other than small immersion heaters. Electric radiators of the upright pattern are not used; on the other hand there is a substantial demand for bowl fires which sell at from 14s. to 30s. In the smaller domestic appliances, electric irons are the most popular; electric kettles are hardly to be found at all, the Portuguese people preferring saucepans. A similar remark applies to toasters, grillers, and hot plates; a small trade is done in hair curlers and dryers and there is a growing demand for electrically-heated cushions. Electric refrigerators are meeting with increasing adoption, and four makers are already represented in the country, one having gone so far as to arrange for the production of the bodies in Portugal.

It is suggested that, despite the limited demand at the present time and a deep-rooted opinion in Portugal that British goods are too costly, any firm contemplating the opening up of business in Portugal might find it advantageous to work in conjunction with a British manufacturer of sanitary ware, the latter being a class of goods in which Great Britain holds a strong position in Portugal where some of the local firms combine the sale of sanitary ware with electrical goods of all kinds. Long credit—in some cases up to 120 days but usually 60 or 90 days—is extended by the wholesale agents to retailers. The duty imposed on electric irons imported into Portugal is 0.16 escudo (gold) per kg. (2.2 lb.) and on vacuum cleaners 0.30 escudo (gold) per kg.; other domestic electrical appliances are classified according to the material of which they are manufactured.

Supply in the London District.

Review of the return relating to electricity generated and supplied in the London and Home Counties Electricity District for the year ended March 31st, 1930.

In our last issue was given a brief summary of the leading statistics contained in the latest annual report published by the London and Home Counties J.E.A., at 5s. net. The additional information given in this column will enable readers who do not wish to delve into the considerable detail presented (very clearly) in the report to form a view on the general developments in this important district during the year 1929-30.

Generation Statistics.

The aggregate capacity of the 58 power stations in operation for supplying the areas of 92 undertakings was 1,643,021 kW, an increase of about 187,000 kW over the previous year. This total was divided approximately in the following proportions. Metropolitan Borough Councils, 22; extra-London local authorities, 14; London companies, 56; extra-London companies, 8. Only 25 stations have been selected for operation under the S.E. Electricity Scheme, but their installed capacities amount to over 90 per cent. of the total.

The aggregate maximum load was 1,368,401 kW (including 429,227 kW bulk supplies purchased), whose allocation (after deducting bulk supplies) among the different classes of undertakings followed closely that of plant installed. The same held good of the 2,516 million kWh generated. The increase in demand over the previous year was 107,000 kW. The load factor of 61 undertakings was between 20 and 30 per cent., and of 22, 30 per cent. and over. About 66 per cent. of the kWh generated was sent out from five stations (regarding certain multiple-station companies as one station) with an installed capacity exceeding 60,000 kW each, and aggregating 1,080,680 kW. The generating costs of these stations averaged 0.242d. per kWh; and the total (including capital charges) 0.466d. per kWh; these figures should be compared with generating costs varying from 0.297 to 0.758d. and total costs from 0.511 to 1.508d. in the cases of groups of smaller stations.

The average generating costs per kWh (including bulk purchased but excluding capital charges) was 0.47d.; the addition of distribution and management costs brought the figure up to 0.66d., compared with 0.71d. in the previous year. The improvement appears to be mainly due to a reduction in generating costs by the companies from 0.5d. to 0.45d. per kWh.

The average number of kWh generated per head of the 1921 population was 508. If the outputs of railway and tramway undertakers (which are not covered by the return) are added the average kWh generated per head becomes 422. Particulars are not available of the output of private plants.

Capital Expenditure.

Total capital expenditure was about £87,000,000, which was allocated as follows (percentages): generation, 37; transmission and distribution, 56; hired apparatus and miscellaneous, 7. The approximate percentage division of capital expenditure among the different classes of undertaking was: Metropolitan Borough Councils, 21; extra-London local authorities, 15; London companies, 50; extra-London companies, 14.

Capital expenditure by the Joint Electricity Authority now stands at about £46,000, nearly two-thirds of this sum representing the value of main transmission lines.

Sales of Electricity.

The 2,024 million kWh sold were used in the following ways (approximate percentages): lighting and domestic, 40; public lighting, 2; traction, 14; power, 44.

Average prices received once more show decreases in all classes (0.18d. for domestic and 0.07d. for power) representing a saving to consumers of nearly one million pounds, or approximately 7½ per cent. Lighting and domestic supplies took about two-fifths of the kWh sold and provided about two-thirds of the revenue. The overall average prices per kWh for each class of supply were: lighting and domestic, 2.87d.; public lighting, 1.27d.; traction, 0.52d.; power, 1.01d.; bulk, 0.62d.

The table of average prices obtained shows that the Metropolitan Borough Councils charged 2.16d. and the London Companies 3.29d. per kWh for lighting and domestic supplies, and, respectively, 1.05d. and 1.12d. per kWh for power. The extra-London local authorities and companies charge rather more for lighting and domestic purposes, but appreciably less for power (0.94d. and 0.87d., respectively). In the case of traction supplies the charge by London companies averages 0.42d. per kWh, easily the lowest for any purposes. Particulars available indicate that separately metered lighting supplies are sold at 3.78d. per kWh, heating and cooking at 1.12d., and lighting, heating, and cooking combined 1.74d.

Amounts Paid in Local Rates.

Nearly £100,000 was applied by municipal undertakings to relief of rates, considerably more than half of the sum transferred to depreciation reserve and renewals.

Rates paid by local authority undertakings outside London were nearly double the amount of the previous year, and by extra-London companies two-thirds more. A halt seems to have been called in the impositions on the London municipal and company undertakings, which, indeed, enjoyed very slight reductions; nevertheless, the increase in rates paid during four years amount, in London, to 50 per cent. and 109 per cent., respectively. The County of London Co. paid £136,000 and the London Power Co. £101,000 in rates in the year under review. The report contains the usual complete particulars for each undertaking of statutory areas, systems of supply, plant installed, kWh output, loads, connections, working expenses, capital expenditure, &c. There is also a supplement giving average prices per kWh sold by each undertaking for (*a*) lighting and domestic, and (*b*) power, during four years. Mention must also be made of the comprehensive schedule of tariffs offered by all undertakings in the district, which has been brought up-to-date at January 1st, 1931.

A Year's Progress.

Review of the tenth annual report of the Electricity Commissioners covering the period April 1st, 1929, to March 31st, 1930.

LAST week we announced the issue of this Report and summarised some of its more important features. We do not propose to repeat these, or to refer to all of the usual features which appear each year, as no doubt readers who desire the full details will purchase the Report itself.* Our account is intended only to draw attention to the most striking and novel features of interest that are presented. The year 1929-30 was noteworthy for the continued growth in the sales of electricity in spite of unsettled trade conditions, and for the substantial programmes of new construction; this result may be contrasted with the decrease in output of undertakings during the depression of 1921-22. The Report records various departmental activities, particulars of which have been given from time to time in this journal, *e.g.*, the "Fuel Returns," the Bedford Demonstration Scheme, Schemes for Central Electricity Board, Scales of Depreciation, &c.

Nearly two-thirds of the 10¼ million kWh generated in 504 stations by authorised undertakings were produced by the 393 public authorities. Including 64 traction and certain non-statutory undertakings, the total kWh generated was close on 12 million, of which 191 stations with annual outputs of 10 million kWh or over generated 95.5 per cent. Consumption per head of the 1929 population (44.49 million) amounted to 193 kWh.

Rural Electrification.

Considerable space is devoted to supply in rural areas, which are defined as comprising areas not coming in the Local Government categories of Municipal, Urban, or Burghal areas.

Of the 668 separate undertakings authorised to supply electricity (an increase of nine over the previous year), including the C.E.B., 394 were publicly owned and 274 belonged to companies or persons. Powers to give supplies for all purposes in rural areas were held by 320 undertakings, and distribution powers covered 59 per cent. of the total rural area of 81,343 square miles and 82 per cent. of the rural population of 9.4 million, the average density of the electrified parts being 162 inhabitants per square mile, compared with 49 in the remainder. The average density in all rural areas is less than one-fortieth of that of urban areas, where the population density averages 4,900 per square mile. About 90 per cent. of the total area of Great Britain consists of woods, waste grass, and arable land. The bulk of the rural population lives in localised communities of various sizes which with outlying farms represent the initial load available. Distribution networks of a much more extensive (and expensive) character are required than for supplies to an equivalent population in urban areas. Returns from 223 undertakings operating in rural areas showed that the cost of underground cable exceeded that of overhead lines by 60 per cent. for high-voltage systems and by 100 per cent. for low-voltage systems. The average cost of 1,455 miles of high-voltage overhead lines was £1,010, and of 1,590 miles of low-voltage lines £564 per route-mile. The installed capacity of 3,840 rural sub-stations, including kiosks and pole transformers, was 432,800 kVA, costing about £3.5 per kVA installed.

Out of 507 million kWh sold in rural areas, over 80 per cent. was taken by a relatively small number of power consumers, who provided 50 per cent. of the total revenue at an average rate of 0.72d. per kWh; 16 per cent. was taken by domestic consumers. The average consumption per domestic consumer was 430 kWh, but most of the supplies in this class were used for lighting. Sales to farms accounted for about 2.9 million kWh, or 1,160 per farm, but no substantial use was being made of power generally.

The average revenue received per consumer was: farms, £11.1; domestic, £5.3; factories, &c., £433; others, £15.6. There was one large consumer (over 15,000 kWh) to 194 consumers of other classes. Over 83 per cent. of the total kWh sold to large consumers were taken by 168 consumers, or 16.1 per cent. of the total number. The average rate to consumers of the other classes was 3.1d. per kWh. The degree of development obtained will be influenced by the existence of two-part tariffs, schemes for assisted wiring, and for the hire and hire-purchase of apparatus, efficient maintenance service, and active propaganda and demonstration.

Extensions of Generating Plant and Mains.

Sanctions were given for the installation of 292,838 kW (compared with 602,818 kW in the preceding year and an average of 500,000 kW per annum in the past nine years) in new or existing power stations. Several important stations were put into commission; these included Hams Hall, Portishead, Kearsley, Deptford (West), Chadderton, and Fort William (hydro-electric). The ratio of aggregate plant installed to aggregate demand was of the order of 100: 60.

Consents were given to the establishment or extension of main transmission lines in 74 cases, the largest number hitherto recorded; these included 277 miles of 132 kV overhead lines, 19 miles of 66 kV underground mains, and 35 miles of 33-kV overhead lines, all to the Central Electricity Board. Applications for Special Orders amounted to 51, bringing the total from January, 1920, up to 699. A pronounced element of competition for Orders was noted.

The number of applications for consent to the erection of overhead lines was 890, an increase of nearly 60 per cent. on the previous year's figures. Inclusive of some prior applications 901 consents were given: *viz.*, 25 to the C.E.B., 245 to local authorities, 373 to power companies, and 258 to other companies. Applications for compulsory wayleaves amounted to 296, an increase of 207. Consents to wayleaves were given in 145 cases, 43 to the C.E.B., 19 to other public authorities, and 83 to companies. Local inquiries were held in 138 cases.

Sanctions to Borrowers.

Sanction for borrowing was given to the C.E.B. to the extent of £4,000,000, and to public authorities of about £17¾ million, an increase of £2½ million over the previous year. Of these amounts, £1,000,000 in each case was applied for by Birmingham and Liverpool Corporations, mainly for the extension of Nechells station and the construction of Clarence Dock station, respectively. Loans sanctioned for wiring consumers' premises and for hire and hire-purchase schemes accounted for over £716,000, an increase for the year of £215,000. In the course of 10 years about £153 million has been sanctioned; 39 per cent. was for plant, 40 per cent. for mains and services (including main transmission lines), and the remainder for land, buildings, meters, wiring, domestic apparatus, &c. The number of bulk supplies taken or arranged were increased by 48, and amounted to 485 in all.

Approval of Systems of Supply.

Approval was given to the use at low and medium voltages of p.i., l.c., compounded, waterproofed, and unarmoured cables laid direct in the ground, and also to the omission of protective covering of cables laid at a depth of not less than 3 ft. below the surface in situations other than public roads. The most novel of the systems approved, however, was one of the South Wales Electrical Power Distribution Co., involving the conversion of a.c. to 120-kV d.c. for transmission and ultimate reconversion to 3-phase a.c. at 50 cycles. The following Associations were the subject of 27 consents in respect of payment of subscriptions and expenses of membership: E.D.A., B.E.S.A., I.M.E.A., E.R.A., and the National Register of Electrical Installation Contractors.

Revisions of Prices.

Applications for downward revisions of maximum prices in 13 areas were considered, and for an upward revision in one area. In one instance it was the declared object of the complainant local authorities to secure a reduction in charges to the large number of small users supplied by the North-East Coast power companies. It was shown that of the 82,000 domestic consumers, nearly half were of the slot-meter type taking an average of only 70 kWh per annum. The companies submitted that no case had been made out to show that the total revenue from domestic and shop consumers as a whole was excessive, and that their tariffs had been so framed as to apportion the revenue fairly between the different classes of consumers. No revision of the maximum prices was imposed. In only one case was an Order made for a reduction of the maximum price, *viz.*, to 5d. under the Wandsworth E.L. Order.

Provisions in Special Acts.

The Galloway Water Power Act, 1929, contains some unusual provisions. It enables the Electricity Commissioners to make provision as to the relation between charges for electricity and divisible profits. A two-part tariff, at the option of consumers, has its fixed component based on wattage of lamps installed. Electricity for lighting may be supplied in areas not operated by existing distributors. The company may not give bulk supplies to authorised undertakers without the consent of the C.E.B., but the latter may supply direct to such undertakers. The hydro-electric works are subject to purchase by the Board of Trade, and the remainder of the undertaking by the J.E.A. (if any) or some other public body authorised for the purpose.

The staff of the Electricity Commissioners numbered 78 (37 established). The administrative expenses to be apportioned among authorised undertakings on the basis of kWh sold amounted to £47,500 (approximately the same as in the previous year), or 1.5d. per 1,000 kWh. Frequency standardisation expenses are also apportioned in the same way, except that revenue from sales to other authorised undertakers is excluded; the initial levy of £50,000 involved a payment of about 2s. 2d. per £100 of revenue.

* H.M. Stationery Office, 3s. net.

The Societies and their Doings.

The subjects discussed below include radiant heating, overhead-line wayleaves, radio direction-finding, and Faraday's experiments.

The Control and Distribution of Radiant Heat.

WHILST considerable attention had recently been directed to the obtaining of comfort by means of radiant heat, Mr. C. G. Heys Hallett, M.A. (Cantab.) at the Institution of Heating and Ventilating Engineers contended that the future development of the art would depend to a large extent on the care with which the underlying principles were investigated.

Discussion of the theory would assist in diverting energy from admiration of present achievements to a search for an answer to the question: "How may it best be done?" The criterion of success must be the quantity of radiation actually received by the individual in the room. Uniformity of the air temperature throughout a room could not be obtained by convectors and the thermometer was no guide to comfort, so that uniformity of its reading was therefore no guide to uniformity of comfort, any more than the fact that a man was not suffering from measles was an indication that he was in perfect health.

The human body was a generator of heat, readily adaptable to varying conditions; the object of a heating installation was, however, to avoid the necessity for adaptation to provide comfort. In a state of comfort, therefore, loss of heat from the body by radiation was the predominant factor. If the room conditions became too cold the heat loss from the body might be restored to normal, either by increasing the air temperature, or by providing radiant heat; if the walls or windows were particularly cold, the rise in air temperature required would be great, thus giving rise to a feeling of stuffiness. However, low air temperature could be compensated for by high radiation with distinctly pleasant results.

An instrument to measure comfort must, therefore, be based

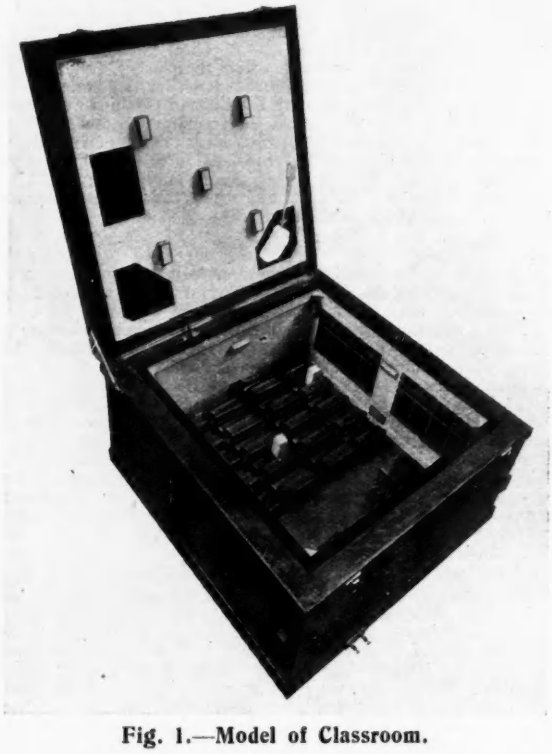


Fig. 1.—Model of Classroom.

on the principle of rate of heat loss from a heated body. Such an instrument was in existence at the Building Research Station, Watford. It consisted of a black copper cylinder 7 in. in diameter and 22 in. high, heated by means of a constant input of about 20 watts, which under comfortable conditions would be adequate to maintain the surface of the cylinder at 75 deg. F. A thermally-operated switch located inside the cylinder controlled the heating installation so as to maintain conditions in the room such that the cylinder was kept at 75 deg. F. If the constant input was reduced, the conditions in the room would have to be warmer in order to maintain the cylinder at 75 deg. F., and in that manner the predetermined degree of comfort was adjusted. A "Eupatheostat" of commercial form, suitable for the automatic control of comfort in all classes of buildings, had now been placed on the market and was known as the "Morganite" thermostat.

Raising the temperature of the structure of the building introduced sluggishness and greatly increased the heat loss from the building. All ordinary wall surfaces were very poor reflectors; only some 10 per cent. of the incident radiation was reflected, the remaining 90 per cent. being absorbed and disposed of by re-radiation, conduction through the wall, and convection to the inside air; if the amount conducted predominated then it was clearly wasteful to allow radiation to

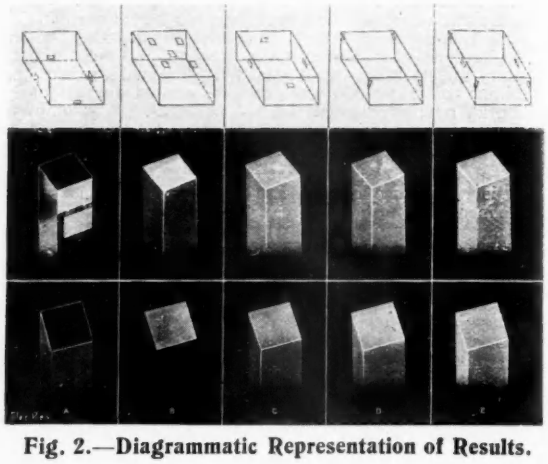


Fig. 2.—Diagrammatic Representation of Results.

fall on the surface of the wall at all. A rise in temperature of the floor was of direct value in warming the feet by conduction; all radiation should, therefore, be directed on the floor and internal walls in preference to the external walls and ceilings. The heat absorption by furniture would be completely returned to a room and, provided that the screening of occupants was not serious, furniture was a distinct asset to a radiant system. The diathermancy of glass was exceedingly low; of the total radiation of wavelength 5 μ falling on glass, approximately 4 per cent. was transmitted. A negligible quantity of heat would, therefore, escape from the room by radiation.

The "Morganite" radiation system employed a number of panels 2 ft. by 1 ft., operated at a moderately high temperature, which could be mounted in any positions and at any angle to the surface of a wall or ceiling. In a room 16 ft. square heated by four such radiators mounted across the corners of the room over that part of the floor likely to be occupied the heat distribution could be made almost uniform, the variation being of the order of 10 per cent.

As an alternative to calculation, heat distribution could be investigated experimentally. Fig. 1 illustrated a model on a scale of 1 in. to 1 ft. of a classroom fitted with a number of model radiators emitting visible light with the same distribution as was obtained with radiant heat from the radiators; five different combinations of radiators were fitted for comparison. The two white objects represented people, while the arrow showed the aperture through which the observations were made. The results were shown in fig. 2: the diagrams at the top showed which radiators were in use, the upper row showed the results obtained with the white block in the centre of the room, while the lower row referred to the block in the corner.

(A) showed the effects of four radiators mounted within about 9 in. of the floor. Heavy shadows were thrown by the desks and the vertical intensity was nil. The lower picture showed that on moving towards the window the intensity from that direction was considerably diminished.

(B) illustrated the effects of radiators mounted on the ceiling alone. In the centre of the room, as shown by the upper figure, the vertical intensity was greatly in excess of the horizontal ones, while moving towards the windows, as shown by the lower figure, greatly reduced both the vertical and horizontal intensities.

(C) indicated the effects of four radiators mounted one in the centre of each wall 7 ft. 6 in. above the floor. The correct relation between vertical and horizontal intensities was obtained in the centre of the floor, except that the four horizontal intensities were equal. Moving towards the win-

dows reduced the horizontal intensities, while leaving the vertical component substantially unchanged. The variation between the two positions was not great.

(D) showed the effects of four radiators mounted at a similar height, but placed in the four corners of the room. Again, of course, symmetry was obtained in the centre of the room, but there was considerable variation in intensity between the two positions.

The sides of the room were 22½ ft. long, the diagonal being about 32 ft. (C) and (D) indicated that the maximum which could efficiently be heated by means of those dispositions of radiators was being reached, and any further increase above about 28 ft. required some form of direct heat to the centre (say, by means of combined heating and lighting units, while the horizontal intensity was provided by the radiators fixed on the wall).

(E) showed three radiators mounted in the corners and one mounted in the centre of each external wall, which disposition fulfilled the desiderata and was employed in the actual installation. If the whole ceiling were heated by embedded pipes, or applied panels, the effect would be almost precisely similar to (B) in fig. 2.

It must be thoroughly understood that no direct comparison between scientifically-applied radiant heating and air heating was possible, for air temperature was not a complete guide to comfort. The comparison should, therefore, be between a system which maintained a steady state of comfort and one which did not. The classroom referred to was controlled by a "Eupatheostat," while the one next door (similar in every other respect) was controlled by an air thermostat. On November 5th (the coldest day in 20 months) the sun shone brightly and the first room consumed 15 kWh during the whole day, while the other room took 53 kWh. Since that date a day occurred on which the former took about 2 per cent. more power; the average, however, was in favour of "Eupatheostat" control.

Wayleaves Discussed at the Overhead Lines Association.

Mr. W. C. Bexon, President, opened a discussion at the February meeting of the Overhead Lines Association by explaining that it was necessary to see the tenant first and then the land-owner, and with luck the necessary sanctions would be obtained in three or four months. The railway companies had no standard wayleave agreement, and in his own case the railway company demanded a fee of three guineas for the printed document in the case of every wayleave, so that if there were 20 or 30 of them a year the supply authority would have to hand over to the railway company quite a considerable sum of money. Furthermore, from information compiled by Mr. L. Stanton, it was clear there was nothing like standardisation of the rentals which the Ministry of Transport had fixed in deciding the various applications. Indeed, at present there existed the O.I.A. agreement, the Central Electricity Board had an agreement, the I.M.E.A. had a standard form of agreement, and the railway companies had agreements; if out of all those some standard form could be devised it would be of the greatest possible assistance.

Mr. L. Stanton said that the information the president had referred to had been compiled from the fifth, seventh, eighth, and ninth reports of the Electricity Commissioners and showed that applications made by various undertakers to the Ministry of Transport for the erection of overhead lines numbered 160 in 1923-24, and no fewer than 560 in the year 1928-29, an increase of 250 per cent. Applications made under Section 22 of the Act of 1919 concerning wayleave rentals in 1924-25 numbered twelve, whereas in 1928-29 they numbered 89, an increase of 641 per cent., whilst the applications in 1927-28 represented an increase of not less than 791 per cent. over 1926-27, the respective figures being 53 and 107 applications. Further information extracted from those annual reports emphasised in a striking manner the need for clarification and simplification of the issues involved, and included information of 44 cases of rental value variation.

Mr. R. Borlase Matthews said that Mr. T. Stevens, Mr. W. Fennell, and himself had acted as a sub-committee of the Association on wayleaves, and had attended conferences with the Commissioners. In South Germany when an electricity supply undertaking desired to put up a new line it prepared the usual drawing showing the direction of the line, and a local inquiry was held with the object of endeavouring to arrive at the best route in the interests of the community. After a decision was given the landlord had the right of appeal, but if he did so the judge who heard his appeal was instructed to consider whether or not the overhead line would increase the rateable value of the particular land. In every case in which a landlord had appealed the judge had decided that the rateable value of the land had gone up, and the result was that landlords did not now appeal from decisions in such cases. It would be very helpful if the Association could recommend four classes of wayleave. The Overhead Lines Association should endeavour to secure a standard form which would cover the many to which he had referred, because the differences between them were very slight. The Post Office form relating to telephone and telegraph lines was a model of simplicity and one which thousands of country people were already accustomed to. Although the great majority of them were reasonable, much of the trouble was due to land-owners having absolutely no idea of the value of what they were asking.

Major Theodore Rich said that if propaganda vans could go round the countryside demonstrating what could be done with electricity, as was being done on the Continent, it would make the getting of wayleaves later on very much easier, because the farmer would then know what he was going to get from the use of electricity.

Mr. W. Fennell, speaking of delays in obtaining local consent, said that a rural district council received ten applications during the last twelve months and the average time taken to deal with them was ten and a half weeks. Another rural district council had taken an average of twelve and half weeks to express its approval, and in one case seventeen weeks. In no case had there been any objections; it seemed to be simply dilatoriness, and there was no reason for it. Therefore, he suggested that a time limit ought to be fixed by the Ministry of Transport within which objections should be raised by local authorities; the limit should be one month, the same as in the case of underground mains. He had never paid land-owners' and others' lawyers' fees, although he had been asked on several occasions to do so, and he did not believe the Ministry of Transport would insist upon supply authorities paying lawyers' fees of that nature.

Mr. J. A. Sumner suggested that of every 100 persons who applied for positions as wayleave officers not more than 8 per cent. had previous wayleave experience; of that 8 per cent. not more than 3 per cent. had had an opportunity of becoming specially trained. If means were provided for specially training men to ensure that they had both the necessary technical and legal ability, there would be far less difficulty in obtaining wayleaves.

The **President**, in bringing the meeting to a close, appealed to all in a position to do so to send information to the Secretary which could be brought before the Council to assist its endeavour to draw up a reasonable wayleave agreement.

A New Radio Direction-finder Corrector.

A PAPER read by Mr. C. E. Horton, M.A., before the Wireless Section of the Institution of Electrical Engineers deals with the experimental development of radio direction-finders for marine purposes as carried out at H.M. Naval Signal School at Portsmouth. It treats generally of the field of a wireless wave in the vicinity of a ship, and indicates that both semi-circular and quadrantal correctors will usually be required to obtain readings of high precision and to correct the observation for deviations due to the ship. Typical forms of those types of corrector are described and their relative advantages indicated, whilst the principles underlying a new form of practical sense-finder are explained.

In the case of a "perfect" system giving two sharp zeros 180 deg. apart, in order to resolve the ambiguity, it is usual to employ some form of receiving system with a cardioid characteristic. This has two disadvantages: first, the minimum of the cardioid is displaced 90 deg. from the two original zeros and therefore necessitates a separate sense pointer; and, secondly, the determination of sense is an additional operation which is done after the bearing has been taken accurately with the figure-of-eight characteristic. This entails a loss of time, necessitated by the fact that the cardioid itself is not generally suitable for taking accurate bearings.

To overcome these defects a sense-finder has been developed by the author, in conjunction with Mr. Cecil Crampton, B.Sc., also of H.M. Signal School, which has the merit of blurring the reciprocal zero while leaving the true zero as sharp as before and in the original position. In other words, the operation of taking a bearing and determining the sense is one and the same, exactly as with the beam loop corrector. The device has a main rotating coil and an auxiliary coil at right angles to and rotating with it; an open aerial is not coupled directly with the coils. The rotating coil alone gives two zeros 180 deg. apart. When the aerial is added both zeros are blurred, but by the further addition of the second coil, one of the blurred zeros can be converted into a perfect zero, while the other becomes still more blurred.

The whole system amounts to the addition of a cardioid to a figure-of-eight with the following conditions:—(1) The e.m.f. of the cordioid is in quadrature with the e.m.f. of the figure-of-eight; (2) the zero of the cardioid coincides in direction with one zero of the figure-of-eight. The actual amplitude of the cardioid is theoretically immaterial, provided the phasing is correct; but the essential advantage of the scheme is that the sense is completely determined without prejudice to the accuracy of the bearing when the amplitude of the cardioid is only a small fraction of the amplitude of the figure-

of-eight. An imperfection in the cardioid, either of shape or phase, gives only a negligible error of bearing.

A sense-finder similar in operation to the beam loop corrector is thus available for circumstances in which no suitable auxiliary e.m.f. is present from the action of surrounding structures. It is obvious that by using a goniometer with a search coil carrying two windings at right angles the same result can be obtained with a Bellini-Tosi system. It is also of interest to note that the principle of this sense-finder can be applied to the transmitting beacon to give one direction having a true zero of radiation and a direction 180 deg. from this with a finite amount of radiation.

Faraday's Experiments Reproduced at the I.E.E.

THE popularity of the memorial lectures delivered from time to time at the INSTITUTION OF ELECTRICAL ENGINEERS and its local Centres was again manifest on February 26th, when PROF. W. CRAMP gave the seventh Faraday Lecture in London. The hall was crowded, and seldom has a lecture of this nature been presented in a more attractive or fascinating manner. In the words of the president (MR. C. C. PATERSON) in expressing the thanks of the meeting to the lecturer, it was stimulating to be carried back, in the manner we were, to the atmosphere of the days in which the pioneers of science worked and thought, but it was not easy to find lecturers capable of doing justice to their subject. Lectures such as those, continued the president, were historical researches and to be able to present the subject in a worthy and artistic manner was a very rare gift. The lecture was unique in that Prof. Cramp, with the aid of his assistant, Mr. Franklin, presented exact replicas of apparatus and experiments which Faraday carried out, and to Mr. Franklin belongs the credit of having made much of the apparatus used.

PROF. CRAMP said the Institution had established the Faraday Lectures in perpetual memory of the greatest experimental physicist the world had ever known. The year 1931 was the centenary of remarkable discoveries without which the electrical engineering industry could never have come into being, and it was to be celebrated by the Institution, the Royal Society, the British Association, and the Royal Institution. In establishing those lectures the Institution had the one great object of arousing interest in electrical matters amongst those to whom such things were often a mystery, and for that reason previous Faraday Lecturers had often dealt in a simple manner with some common application of electric power. This year, however, such a course seemed to him inappropriate, and it occurred to him that there were two ways of dealing with the lecture on this special occasion. One was to give an oration on Faraday, after the French model, as was done at the Ampere Centenary, and the other was to try and bring home to his audience in the simplest and most vivid manner the state of knowledge of electromagnetism as it was in July, 1831, and in December of the same year. He had chosen the second plan because he knew it to be the course Faraday would himself have selected. Faraday, unlike Ampere, was not a mathematician; his methods were essentially those which built up convincing evidence by simple experiments explained in terms of physical pictures. By the kind permission of Sir William Bragg he had been permitted to handle precious documents at the Royal Institution which Faraday himself had written. As a result he had found that the order of his experimental researches was not the order of his laboratory notes, but the latter showed how Faraday went from step to step, and Prof. Cramp endeavoured to demonstrate the experiments in the order indicated in the notebooks. He therefore first outlined something of Faraday's life and his earlier knowledge; then something of the origin of the problem which he solved during the year 1831, and finally indicated Faraday's work on the same subject prior to 1831.

The son of a blacksmith born at Newington Butts on September 22nd, 1791, Faraday was apprenticed to a bookseller in Blandford Street at the age of 14, and remained there until he was 21. Having attended some of Sir Humphrey Davy's Royal Institution lectures, Faraday prepared notes upon them which he submitted to Sir Humphrey, and as the result of his own seeking for employment there was subsequently engaged in 1813 at 25s. per week with two rooms at the Royal Institution. Then followed a short account of Faraday's visit to the Continent with Sir Humphrey and Lady Davy in the same year, his meeting with Gay Lussac and Ampere, his subsequent return to England, and, in 1815, the increase of his remuneration to 30s. per week. He was "a most lovable man, gentle without being weak, humble without being insinuating, and sympathetic without being sentimental, or insipid."

The absence of measuring instruments was emphasised by the rough and ready tests that were resorted to in order to make sure that an electric circuit existed, such as placing two wires on the upper and under sides of his tongue, or watching the effect on the muscles of a dead frog. Faraday used a primary battery as the source of his current, sometimes as many as 140 pairs of plates, but he did not know how much current he was getting and it did not matter to him so long as his apparatus worked. Prof. Cramp repeated a number of the well-known experiments associated with Faraday at that period with apparatus made to dimensions according to his laboratory notebooks and followed through the work which led up to his discovery of magneto-electric induction. He indicated the precise manner in which Faraday obtained attraction and repulsion effects and how, following up the work of Oersted in Copenhagen, the relationship between electricity and magnetism was demonstrated experimentally. The fundamental law underlying electromagnetic machinery was stated perfectly by Faraday, and one could not express it better in 1931 than he did in 1831. No one, however, knew better than Faraday that he was not an inventor; he was a discoverer, a very subtle difference.

In the course of his concluding remarks, Prof. Cramp said he did not think one should hastily conclude that if Faraday had never lived the work which he did would not have been done by others; but what could be said of Faraday was that he had an uncanny grasp of the physical conditions underlying phenomena which could neither be seen nor named, coupled with his untiring work and affection for his experimental methods, which enabled him to bring a wide range of observations within the compass of a single theory, or law. In that way Faraday in one year did the work of 20 years and enabled more commercial and less philosophical minds to build up a great industry on the entirely reliable foundations which he had provided. Faraday was transparently honest and sincere with a deep and unassailable reverence for the truth, and, for that reason, would always stand as an example to the present and future generations.

Faraday and his contemporaries are the subject of six talks which Prof. Cramp is broadcasting through the B.B.C., whilst a lecture on his work was broadcast on March 4th by Sir William H. Bragg, director of the Royal Institution of Great Britain, who holds two of the posts which Faraday once adorned, namely, those of Fullerian Professor of Chemistry and director of the Davy-Faraday Research Laboratory at the Royal Institution.

Television Lecture and Exhibition.

LECTURING on television developments before the ROYAL SOCIETY OF ARTS, MR. W. G. W. MITCHELL, B.Sc., hon. secretary of the TELEVISION SOCIETY, emphasised the fundamental difficulty of the time factor in scanning each scene to be transmitted. It was not possible to transmit each complete picture as a "packet" of light impressions, and modern developments showed a tendency to compromise between the "packet" and "long ribbon" methods by treating each picture as a number of zones and using a separate transmission channel for each zone.

The lecturer thought that some form of "photographic pick-up," such as a film, would have to be used in future for recording and storing pictorial events as a partial solution of the optical problems involved. The principle of "vignetting" a picture, so as to send only the centre of interest in finer detail, would assist transmission difficulties in radio, where already the synchronising of picture-frequency signals imposed an extra strain on the radio channel. At the transmitting end the modern photo-electric cell had reached a high state of development, and in response it nearly approached the human eye, but at the receiving end some more efficient form of light-integrating device other than the neon lamp was needed.

The American Telephone and Telegraph Co., which was responsible for the two-way television system, was primarily seeking information as to the value of the addition of sight to sound in personal conversations over the telephone. The extra apparatus for providing vision was bulky and the operating costs were heavy, but further development work was in progress to reduce those defects.

There was hope of purely electrical methods, such as the cathode-ray method, becoming more widely used as soon as the high voltages required for operating it could be reduced. But the lecturer looked for the next big development in the direction of zone methods used in conjunction with wired transmitting circuits, which should make it possible within a year or two to have a picture of the size and brilliancy of the kinema screen picture of to-day. When that had been achieved receivers for use in the home might follow after some years.

The third annual exhibition of apparatus relating to television, picture-telegraphy, and talking films, is to be held by the Television Society at University College, London, on April 15th, 1931. As on previous occasions, members of the Society exhibiting apparatus have the right of entering their exhibit in the annual competition for the "Tuke Cup," which is awarded by an independent committee of judges for "the most meritorious exhibit" in relation to television or cognate subjects.

New Apparatus and Devices.

Domestic, Cooking and Heating, Lighting, Power, and Scientific.

A Fine-wire Welder.

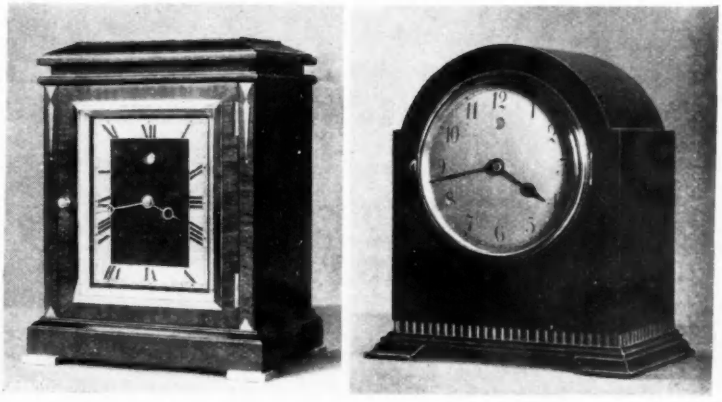
The accompanying illustration, fig. 1, shows the No. 101 welding machine produced by BRITISH INSULATED CABLES, LTD., Prescot, Lancashire, for operating on fine copper wires. The wires to be welded are clamped in the machine in the usual manner, after which the swinging arm is released, the current applied by the small switch lever, and the weld is automatically made. The machine consists of a small single-phase transformer, the primary being wound for any of the usual supply voltages. There is a plug and flexible cord at the back of the machine to which must be connected the adaptor or plug to suit a customer's connections. On the front of the machine is a regulating switch with 4 positions. "Zero" is on open circuit, and "1," "2," and "3" are fast, medium, and slow speeds, respectively. The clamps are mounted on the top of the machine, the one on the left-hand side being fixed to the base, and that on the right mounted on a swinging arm. This arm is kept in an open position by means of a small lever which is capable of adjustment by means of a suitable screw. The movement of this screw in either direction opens or closes the gap between the two clamps. On top of the machine is a small operating double-acting switch; the circuit is closed by hand and opened by means of a knock-off rod attached to the swinging arm of the machine.

Fig. 1.—"B.I." Wire Welder.

Special Mains Clocks.

With the introduction of clocks worked from electricity supply circuits it has become necessary to provide some means whereby they continue to operate in the event of supply interruptions, and in this connection Messrs. LANDIS & GYR, LTD., Elgee Works, North Acton, W.3, have produced a range of "Inducta" clocks, which, owing to the mechanical reserve of the movement, will continue to run for at least three days with the supply disconnected. They are made for either a.c. or d.c. supplies, and are each fitted with a practically silent winding motor. A 5-ft. length of flexible lead, with the necessary plug, is supplied with each clock, and the connection can be made without any interference to the movement or to the winding motor. The movement is actuated by a spring wound up at intervals by the motor, and the operation of the movement is controlled by a high-class lever escapement.

Two types of movement are constructed, which differ in principle only as regards the kind of winding motor employed, a.c. or d.c. For a.c. a motor of the "Ferraris" type is employed; it is permanently in service and winds up the operating spring to the prescribed limit as soon as the spring has run down by a certain amount, the winding being limited by a simple mechanical brake on the electric motor. This construction avoids the use of a contact switch and consequent sparking. The a.c. motor is suitable for all pressures up to 280 volts, and for frequencies up to 60 cycles. For d.c. a commutator motor having a very small current consumption is employed with a resistance in the circuit. Poth the motor and the resistance are designed for use on all voltages within the two ranges of 110 to 132 and 200 to 250. On request, however, a motor may be supplied suitable for pressures outside these limits. The movement is so fastened on and between two end plates that no strain can be introduced. The gear train is of very sturdy construction. By reason of the special design of the starting and stopping device of the motor, the spring, which continues to drive the movement during the winding period and also acts as a reserve, cannot be overwound or completely run down; thereby the driving moment of the clock is maintained within a definite limit which is required for maintaining accurate timekeeping. This holds valid, not only during the progress of the normal winding period, but also during the running down of the mechanical reserve and until shortly before the clock stops. The high-grade lever escapement has 11 jewels. For temperature compensation "Elinvar" metal is employed, so that the influence of temperature variation on the running of the clock is practically negligible. When the clock is completely run down there is naturally no driving moment or torque for the escapement. The balance spring would then be released and therefore the escapement as well as the balance wheel would be liable to damage through shocks in transit. For this reason a locking device is provided on the escapement, which can be operated externally. In producing these clocks the aim has been that the movements and the cases should be of the very highest quality and finish. The cases of the mantel clocks are made of either burnt walnut or mahogany in a variety of attractive designs to meet the varied styles of furnishing. When the clocks are required for hanging on the walls they have cases of highly finished metal, or can be supplied in carved wood to meet various tastes, figs. 2 and 3. All the clocks can readily be adjusted whilst in position, and the accuracy claimed is within one minute a month.



Figs. 2 and 3.—Examples of "Inducta" Electric Clocks.

New Labour-saving Conduit Fittings.

Improved labour-saving designs have recently been introduced by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, and incorporated in its range of conduit fittings. The following notes concern a few of these. One of the simplest and most useful innovations concerns the position of the outlet in oblong junction boxes. These are now placed very close to the corner of the box instead of at the middle point of each side. The convenience of this is particularly marked in corner boxes and tee boxes, where the new design enables the tubing to be run close to the corner of the wall and to enter the box without any sets. Somewhat similar advantages are given by the use of angle tee inspection fittings as a substitute for circular inspection tees. These fittings are becoming very popular as they fit close up to the wall in the corner, the outlet on the wall side being flush with the side of the fitting. New inspection couplers are very useful for installing next to bends, the removable cover facilitating the easing of the cable round the bend, and being a little wider than the tubing itself they can be fitted where required without interfering with the straight run of the conduit and cable. A new type of multiple flush switch box has recently been developed in which the switches are mounted on a grid that can be easily adjusted, enabling the switchplate to be made properly flush with the vertical surface of the wall or adjusted at an angle as required. The interior of the box is provided with a suitable number of long screws fitted into the back of the box, and passing through holes in the grid; these screws are fitted with serrated nuts on which the grid rests, the edge of the nuts extending beyond the edge of the grid. The grid is so designed that while it is still in position a tool can be inserted from the front of the box and every nut turned indi-

vidually, thus enabling the grid and switches to be raised or lowered to bring the switchplate exactly in the required position. After adjustment the grid is secured by means of threaded sleeves, slotted at the top for the screwdriver.

A New "Turn-down" Lamp.

A recent production of Tungsram Electric Lamp Works (Gt. Britain), Ltd., 72, Oxford Street, W.1, is a "Turn-down" lamp for use in halls and nurseries, &c., where, although a light at all times is necessary or desirable, full illumination always is extravagant. By operating a chain, the lamp can be made to give a soft-glow, or a brilliant light, as required. The lamp is of the opal-glass type, and is fitted with the "D" filament incorporated in all "Tungsram" lamps.

Ball Anodes for Cadmium Plating.

The arrangements adopted by Messrs. W. Canning & Co., Ltd., 133 to 137, Great Hampton Street, Birmingham, for the use of a new form of anode for cadmium plating which has been devised with the object of reducing anode waste to the lowest possible point are depicted in figs. 4 and 5. The balls are held in a steel cage, and the hook itself is of special design giving firm two-point contact, while the loop above facilitates removal from the vat. As the balls dissolve away new ones are added as required. The steel cage remains permanent. The semi-circular cage is a special means of suspension for use in barrel plating.

Figs. 4 and 5.—Suspension Arrangements for Cadmium-ball Anodes.

A High-speed Portable Electric Saw.

There has recently been introduced in this country by Messrs. Benjamin Whittaker, Ltd., Victoria House, Vernon Place, Southampton Row, W.C.1, the "Speedmatic" electric saw, the blade of which is mounted directly on the motor armature shaft, which runs on two precision ball bearings of the dust-sealed unit type. By reason of the absence of gears, the full power of the motor is applied directly to the saw blade, and weight is saved. Since the saw weighs only 12 lb. and is well balanced, it can easily be operated with one hand while the other holds the work. Adjustment for depth and angular cutting is obtained merely by turning a thumb screw. The cooling fan is built on to that part of the armature shaft which is inside the blade guard, so that the fan cannot get loose and injure the motor windings. The motor is of ¼ h.p. and is suitable for working on either a.c. or d.c. The saw blade is fully guarded at all times, even when cutting at an angle; the guard consists of an upper part fixed to the frame, and of an auxiliary guard, covering the lower part of the blade, hinged to the fixed guard and held into position by a small coil spring. An efficient accessory to the saw is an aluminium weather-stripping guide which clamps on the bottom of the base, prevents binding and assures a straight cut in ripping or weather-stripping work.

Fig. 6.—The "Speedmatic" Gearless Saw.

All-insulated Accessories.

Two new lines of the above introduced by Messrs. J. H. Tucker & Co., Ltd., Kings Road, Tyseley, Birmingham, are a range of switchplates in brown, white and old-ivory colour moulded "Telacite" and a range of miniature 2-in. diameter base, 2- and 3-plate ceiling roses in brown porcelain for use in lieu of bakelite. The switch plates have bevelled edges, but with an etched border design on the surface of the plate. These plates are of slightly larger dimensions than the usual standard sizes, and for that reason they are suitable for replacement works, as the increased size permits the soiled lines usually left on a wall to be covered. With regard to the ceiling roses, it is claimed that vitreous porcelain is a more effective insulator than bakelite, and also cheaper. In addition to the 2-plate ceiling rose with ordinary terminals, there are available both 2- and 3-plate miniature brown porcelain ceiling roses fitted with "Kwikwire" terminals. In the "Kwikwire" ceiling rose the terminal plate is mounted on the top of the terminal, nearer the top of the ceiling-rose partition, and in consequence it is more easily accessible. The terminal for the flexible connection is of the screw and washer type, whilst raised ears adjacent to the screw prevent the strands of the flexible spreading and ensure firm gripping beneath the head of the terminal screw. The pinching screw in the main terminal is set at an angle, thus giving the wireman plenty of finger and handling room. The 2-in. ceiling rose complies with B.S.S. No. 67, except in its dimensional features.

New Accumulator Separators.

A new type of accumulator separator, "Mipor," which has been developed by Dr. H. Beckmann, of the Accumulatoren-Fabrik Aktiengesellschaft, Berlin, is made from rubber latex, the juice or milk of rubber trees, and consists of minute globules of rubber swimming freely about in an aqueous serum, like the fat or oil particles suspended in cow's milk. The latex can be coagulated so as to produce a colloidal gel, in which the watery fluid and the rubber globules are combined to form a kind of elastic jelly. Finely powdered sulphur is added to the latex before the formation of the gel, which is afterwards vulcanised. To make sure that the product remains porous during and after the vulcanising process, the watery liquid combined with the rubber globules in the jelly must be prevented from evaporating during the process, and the vulcanisation is therefore carried out in water or saturated steam. After vulcanisation, the water is removed by evaporation. The separators may be made either soft or hard, like ebonite, according to the proportion of sulphur added to the latex. Everywhere in the substance where water previously was situated, microscopic pores are formed in such countless numbers that they uniformly penetrate the whole structure. These pores are about one ten-thousandth of an inch in diameter, and there are more than 100,000,000 pores per square inch of separator. The separators are in the form of thin sheets, and the pores are so fine as to prevent the passage of even the most minute particles of active material from one plate to another. Their electrical resistance is very low, and they will stand without injury temperatures higher than those that are injurious to the accumulator plates. Further, they are unaffected by the chemical action of the peroxide of positive plates, and have a much longer life than the plates themselves; they need no attention before the plates are renewed and can be used again when new plates are put in.

Trials carried out by the Accumulatoren-Fabrik Aktiengesellschaft are claimed to have shown that the "Mipor" separator constitutes an important advance in storage-battery engineering, and that it can be relied upon under all circumstances to separate the positive and negative plates of an accumulator efficiently and permanently, and to prevent effectively the occurrence of short-circuits.

The rights to manufacture the new separator in Great Britain, Northern Ireland, and the Irish Free State have been acquired by Britannia Batteries, Ltd., Britannia House, 233, Shaftesbury Avenue, London, W.C.2, at whose factory the separator is already in production.

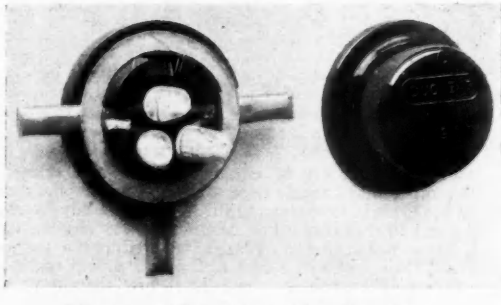


Fig. 7.—"Duo Bar" Junction Box.

A "Universal" Junction Box.

The "Duo Bar" universal junction box, fig. 7, a recent introduction of L.E.S. Distributors, Ltd., 9, St. Martin's Street, Leicester Square, W.C.2, is designed to fulfil the requirements of either insulated or earthed (metal sheathed) wiring systems. The box proper is made of bakelite and consists of two parts, a flanged cover screwed internally on to the base, 2¾ in. diameter. For use with metal-sheathed cables a thin tinned-metal ring is interposed between the cover and base flanges, see illustration. A feature of the box is the absence of connecting and bonding screws; the box is designed for use with "thimble" screw-on wiring connectors.

New "Detectoscope" Models.

We learn that several new models of the "Nivex Detectoscope," the vest-pocket indicator introduced by Runbaken Magneto Co., Ltd., Tipping Street, Ardwick, Manchester,

which we have already described, have been produced since its first appearance. It will be recalled that the device is of fountain-pen size and supplied with a fountain-pen pocket clip, and that it works on the neon-tube principle. Among the uses for which this apparatus is claimed to be suitable are potential (up to 600 V), polarity, a.c. or d.c., leakage, and neutral-wire indication.

A Mercury Relay.

We have already described the radiation thermostat produced by the MORGAN CRUCIBLE CO., LTD., Battersea Works, Church Road, S.W.11, for use in connection with its heating system ("Morganite" radiators). Primarily for use in conjunction with this thermostat the company has now introduced a novel but simple mercury relay, fig. 8. It consists essentially of a vertical glass tube from which projects a horizontal arm containing two contacts. A quantity of mercury, on which floats an iron rod, is sealed into the vertical tube, and when the solenoid is energised, the iron rod is drawn downwards, thus raising the level of the mercury until it flows into the horizontal arm, completing the circuit between the two contacts.

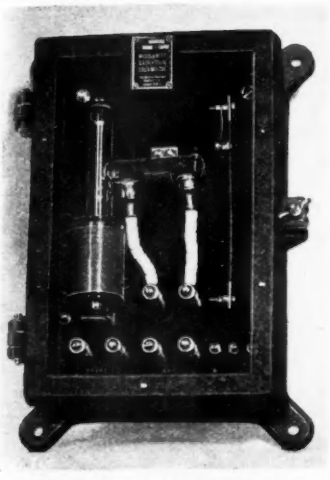


Fig. 8.—"Morganite" Mercury Relay.

A New Lift-driving Gear.

The accompanying illustration, fig. 9, depicts a winding engine recently completed in the works of MARRYAT & SCOTT, LTD., 75, Clerkenwell Road, E.C.1, for an export contract for a dual-control high-speed passenger lift directly connected to totally-enclosed main motor A, with ventilating ducts carried down through the bedplate; an auxiliary brush-shifting motor, with the necessary limit gear and brake B mounted on the top of the main motor; a standard worm reduction gear with the worm shaft extended at both ends, one end terminating in a standard brake drum; and a brake C at the other extended end fitted with a double ball thrust bearing, not clearly seen in the illustration. On this extension is mounted the "Marryat-Scott" patent "Leveltric" clutch D and an auxiliary levelling motor E. The worm wheel shaft is extended normally, and in the illustration is not carrying the standard traction sheave. The worm-wheel shaft has a definite speed range of 7:1 for normal lift driving, and it is rotated at one-tenth of the low speed for final levelling. In effect this gives a lift travelling at from 57 to 400 ft. per minute with perfectly smooth acceleration and deceleration to a final creeping speed for floor levelling of approximately 5 ft. per minute. The design, we believe, is unique, and is what is termed straight a.c. construction.

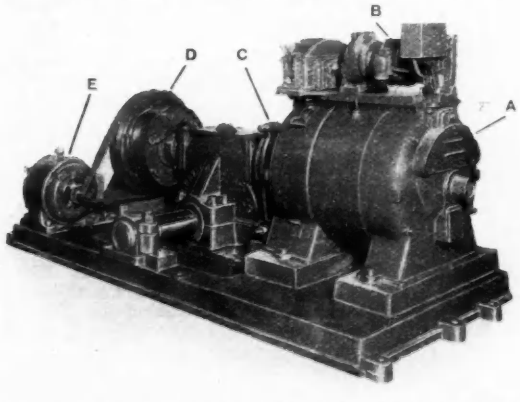


Fig. 9.—Winding Engine with "Leveltric" Clutch.

Open-type Flooring.

Grill flooring is a product of GRILL FLOORS, LTD., 200, High Holborn, W.C.1, which is being used with success in the construction of footwalks, platforms, gangways and stairs for power station engine rooms and boiler houses requiring the passage of a maximum amount of light. It is manufactured entirely without rivets, and being scientifically designed to reduce distension of the main members, gives a structure of great simplicity and strength. It also has the great advantage of being non-skid. The combination of lightness with strength and rigidity enhances its value, whilst it presents the added advantages of greater ventilation and ease of cleaning and painting. To fix and instal the flooring is a simple operation; it is stocked in convenient sizes and lengths, and is also manufactured to customers' dimensions. It is of all-steel construction, and is a British product.

New Dry Batteries.

We learn that the CHLORIDE ELECTRICAL STORAGE CO., LTD., Clifton Junction, near Manchester, has introduced a new dry battery, "Drydex," specially designed for use with radio receiving sets. It is produced in a wide range of multiple units, to meet all radio requirements, in addition to single cells for bells, torches, and pocket lamps.

Improved Washing Machines.

WHITE TILE HEATERS, LTD., 201A, High Holborn, W.C.1, who are the sole agents for the United Kingdom for "Coffield" electric washing machines, have introduced several new models. A special feature in each of these is the machine-cut transmission gear, fig. 10, which is of a very robust design and runs in an oil bath. The driving unit is a ½-h.p. motor in each case. A feature of the higher priced models is the patented "gyrator" impeller which effects speedy and efficient cleansing of the clothes. The wash tub of the cheapest model is made of a special non-corrosive alloy, and on the higher-priced models the tubs are made of "Armco" iron, vitreous enamelled inside and out. These machines have an attractive appearance, occupy a space less than 2 ft. 6 in. square, and can be fitted with "Lambert" electric water heaters, which afford a ready supply of hot water to the wash tub.

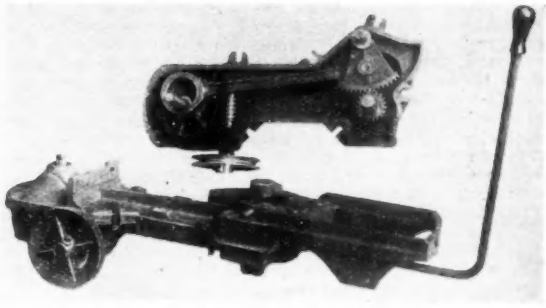


Fig. 10.—Transmission Gear of "Coffield" Washer.

A New Switch-plug.

Messrs. C. H. PARSONS, LTD., Britannia Works, Wharfdale Road, Tyseley, Birmingham, have recently put on the market a new 3-pin switch-plug of the shockproof type with a moulded or bakelite plug and switch cover and a porcelain switch base. It is of the tumbler-switch type, with the plug mounted at the top, of very substantial design, with an excellent switch action, and is produced in 5- and 15-A models. A special feature is the hollow back to the switch base, which avoids the necessity of using a block for mounting purposes. The unit is available in all white, black and brown, and also in brown and white and brown and black. Fig. 11 shows the front of the switch portion with the cover removed.

Fig. 11.—"Britmac" Shockproof Switch-plug.

A New Lamp-locking Invention.

We have received from MR. G. D. HARRISON, Shirley Magneto Works, Hartshead, Liversedge, some particulars of an invention of his, the "Harrison" self-locking lamp. The invention provides for the addition to the usual terminals on the lamp cap of cam-like projections each with a gradual slope at one side which passes under the lampholder plunger when the lamp is inserted and turned in the holder. An abrupt "drop" at the end of the slope permits the plunger to take up its normal position on the lamp-cap terminal when the lamp is in its normal position, and at the same time prevents the returning of the lamp for removal. To effect removal the screw ring holding the socket to the fitting must be slackened.

Reviews.

Electro-plating; a Survey of Modern Practice. By Samuel Field, A.R.C.Sc., and A. Dudley Weill. Pp. x+205; figs. 39. London: Sir Isaac Pitman & Sons, Ltd. Price 5s. net.

In the book under review, the authors have endeavoured to present in simple form an account of the advances which have been made in recent years, particulars of which have hitherto only been available in the official reports of the Department of Scientific and Industrial Research in this country, the American Bureau of Standards in the United States, the various papers which have been presented to our electrical and chemical institutions, and in certain larger treatises, and, we hasten to add, they have succeeded admirably in their task. Within the compass of 205 pages they have included practical details of every important application of the process of electro-plating which is used commercially at the present day.

The contents of the book may be roughly classified into three sections. In the first, the authors discuss the fundamental principles underlying the process of electro plating, and in this section there is a valuable chapter entitled "Sources of Current" in which the production of the low-voltage direct-current is discussed. The question of alternating-current rectifiers, both static and rotary, receives considerable attention, in view of the fact that in the majority of industrial areas alternating current alone is available from the public supply authority's mains. The second section deals with the practical side of electro-plating, the choice of electro-plating plant and of the necessary electrical control gear being adequately discussed. The important question of the cleaning of the material prior to plating is also dealt with in this section, both the mechanical and the chemical processes being described. The third section, which is by far the largest, deals in detail with the processes employed commercially for the deposition of various metals, a separate chapter being devoted to each of the metals, copper, silver, gold, nickel, zinc, cadmium, and chromium, while iron, tin, lead, and cobalt as not being of such great industrial importance are dealt with in a single chapter. Finally, there is in what we might term the industrial section a chapter on the deposition of alloys and one on the industrial processes which may be regarded as allied to electro-plating, such as the oxidisation of aluminium and the production of detachable deposits.

It will be seen from the foregoing that the book covers the entire industrial field of electro-plating, the information being set forth in a most lucid manner which, while it is necessarily brief, is, nevertheless, thoroughly practical and comprehensive. A number of tables given in the appendix covering such problems as specific gravity of solutions of various electrolytes, current carrying capacity of copper conductors, and formulæ for the calculation of weight and thickness of deposits adds considerably to the practical value of the book. The authors are to be congratulated on the thoroughness with which they have accomplished their task, as are also the publishers upon the excellent manner in which they have produced so complete a volume at so low a price.

Electricity in Gas Works. By H. C. Widlake, A.M.I.E.E., A.M.I.Gas E. Pp. xii+186; figs. 15. London: Walter King, Ltd. Price 21s. net.

The use of electricity in gasworks is based primarily upon the fact that, owing to the large amount of waste heat which is available, electricity can be very cheaply produced while the power thus obtained can be easily transmitted to, and controlled at, the many points where it is required, the electric motor lending itself to association with safety and automatic control devices to a greater extent than does any other type of driving machine. Thus, in a certain British gas undertaking instanced by the author 88 electric motors are employed, averaging about 12¼ b.h.p. each, and it is obvious—particularly when consideration is given to the type of machinery which many of these motors have to drive—that neither the gas engine nor the steam engine working either independently or in conjunction with shafts, pulleys, and belts, can compete with the electric motor for service of this nature, especially in view of the fact that the electricity is produced cheaply from waste heat. Having thus justified his thesis, the author then proceeds to describe the various methods available for the generation, distribution, and utilisation of the electrical energy and, while this part of his work is necessarily of an elementary character, and in many respects applicable to many other industries, he contrives by special attention to the problems of the gasworks and by a wealth of comparative figures based upon the use of either gas engine driven generators or waste heat to make his subject of particular interest to the gas engineer. Of particular interest, too, is the chapter dealing with the conversion of existing plant driven by either gas or steam engines to the electric motor drive. This is a subject which is often treated in a very haphazard fashion when the possibilities of the electric drive are under discussion, it often being tacitly assumed that the problem begins and ends with the mere substitution of the motor for the engine. The question of the position of the motor is also discussed in a manner which proves that the author is keenly alive to all those problems which make for success in the use of the electric drive.

Mention may also be made of the interesting chapters dealing with the metering of gas by means of electricity and the use of the different forms of control instruments, distant-reading gauges, protecting devices and so on, which electricity alone has made possible. We can heartily congratulate the author on having produced a very readable and an informative book, and its careful study can be recommended to every gas engineer. Where electricity is not extensively employed, the data given will convince the engineer of the economic advantage of its wider adoption for power purposes; where it is already so employed the study of this excellent book will suggest ways and means whereby greater economies may be obtained.

Quantum Chemistry. By A. Haas, Ph.D. Pp. ix+75; illustrated. London: Constable & Co., Ltd. Price 6s.

In a presidential address to the American Chemical Society, Dr. Irving Langmuir has pointed out very clearly, and justifiably, the need for knowledge of mathematics on the part of the chemist; there is no other road to a proper understanding of the ultimate properties of matter and radiation. Many of us, however, either from faulty early training or, perhaps, innate lack of ability, can never hope to become mathematicians, but would nevertheless like to gather up the crumbs. To such this book of Prof. Haas's is dedicated, and we have to be grateful that a man who can move in the higher planes has condescended to us.

The division into four sections—the arithmetic of chemical periodicity, the quantum theory of valency and chemical forces, electron grouping and the periodic system, and quantum problems of molecular and nuclear structure—has been simply a matter of convenience, arising from the fact that these represent lectures upon which the book is based. It is properly taken as a whole, and since there is compressed into the seventy odd pages some reference to almost every feature of interest in quantum mechanics, it is obviously impossible to give an adequate account of the contents in any detail. One feature which can, nevertheless, not be passed over is the extent to which accurate description and analysis of spectra has influenced theory. In the middle of last century, even with the few facts then available, this gave the physicist an indication that there must be some similarity in the *internal* structure of chemically similar atoms. The effect of a magnetic field on line spectra, studied experimentally by Zeeman and theoretically by Lorentz, linked the free electron of the discharge tube with the bound electron of the atom. Moseley's work on X-ray lines clinched Rutherford's work on the nuclear atom; Sommerfeld's interpretation of the finer details of certain lines pointed the way to the generalisations of Bohr's theory of hydrogen which have now led to a complete theory of the periodic system and of at least the main facts of chemical combination; and at the present moment, study of the hyperfine structure of line spectra is leading to a rapid accumulation of data concerning the spin of atomic nuclei. The amount of information yielded by a full analysis of a complicated spectrum, such as that given by H. N. Russell for the lines of titanium, can only be appreciated by reference to the original papers, and we would recommend readers of *Quantum Chemistry* to glance through some of Russell's numerous contributions to the *Astrophysical Journal* or the *Physical Review*. The spectra of molecules promise to be of as great value, in a slightly different way, as soon as specialists in this branch can be induced to explain the complicated notation to which they are at present committed; already there is definite evidence, for example, that there are two distinct forms of hydrogen molecules, both chemically simply H_2.

It is, however, ungracious to rail at the gods when we should be thanking one who is particularly benevolent; and perhaps the best way in which this can be done is by asking for more. It remains only to add that Mr. Codd's translation is all that could be desired.

Generating Stations: Economic Elements of Electrical Design. By Alfred H. Lovell, M.Sc. Pp. xv+359; figs. 171. London: McGraw-Hill Publishing Co., Ltd. Price 20s. net.

The author is professor of electric power engineering at the University of Michigan, and his book is a most valuable contribution to the all-too-scanty literature of electrical engineering economics. The following summary will give some idea both of its scope and its utility. The first chapter, entitled "Principles of Corporate Finance," is an excellent survey of the economics of capital costs. Methods of raising capital and providing for depreciation are dealt with, and the corresponding formulæ are developed for calculating capital charges. Minor criticisms here are that the annual cost and the capitalised cost methods are not clearly differentiated, no mention is made of cases involving different interest rates on the loan and the sinking fund, nor of funds in which the deposits are made other than at the end of each year. Chapter two deals with the cost of power stations. Most of the information here given is reprinted from other sources, and as it relates almost exclusively to American practice its usefulness to British engineers is not great. The third chapter, however, on economic decay, is extremely valuable since it deals fully and

even adequately with the important subject of depreciation and obsolescence. Chapter four, entitled "Power Plant Load Curves," touches on a variety of topics including cost of generating plant, and concludes with an important section on economic load sharing. Chapter five, on economic conductor section, deals not only with Kelvin's law but also the economic choice of voltage and system. The sixth chapter, on power plant location, has some interesting charts and it treats the subject with the detail and planning science which in this country is too apt to be confined to the communication engineer. The next few chapters are somewhat out of keeping with the remainder of the book, being descriptive in character and dealing with reactors, circuit-breakers and relays. However, general principles are reverted to in two short chapters on single-phase short circuits and the solution of line problems, the last-named making use of the circle diagram and symbolic notation

The author has a weakness for quoting large blocks of figures in full instead of digesting them and presenting the results in the form of percentages or graphs. Just as some people, it is said, cannot pass a public house, so he seems to find it difficult to pass a table without reprinting it. For example, in the middle of one chapter appears a complete wire table reprinted, without any additions, from an engineering pocket book. There appears to be no reference to it in the text, nor is it indexed. Even if it were suddenly needed by the reader he could more easily find it elsewhere than by searching for it in the body of the text. The descriptions of apparatus (switchgear and the like) might also with advantage be left to books dealing specifically with this gear or with supply apparatus in general. Thus much granted it must be said that this is one of the most stimulating books on electricity supply that has appeared for a very long time. Too long have we regarded physical design as the only begetter of electrical engineering, forgetting that economic design (and economic utilisation) is an equally essential parent. The author has grasped this fundamental fact and our gratitude for this must far outweigh any criticisms on the score of selection or redundancy. The student who wishes to obtain an insight into the economic make-up of electricity generation, or the practitioner who wants to get the last ounce out of his plant or the best return for his expenditure will equally find it a most valuable treatise. Most of the chapters conclude with a large selection of problems, and those of an economic character constitute the most comprehensive collection that has yet appeared on this subject, but answers are not given.

Parliamentary Notes.

[By our Special Parliamentary Reporter.]

Telephone Service to Channel Islands.

On February 23rd Mr. Everard asked the Postmaster-General when the telephone service between England and the Channel Islands would be completed.

Mr. Lees-Smith said that he hoped to open a public telephone service between most of the principal towns in Great Britain and the towns of St. Peter Port, Guernsey, and St. Helier, Jersey, towards the end of March. Extensions of the service to other places would be effected as soon as possible.

The Indo-European Telegraph Department.

On February 23rd Lieutenant-Colonel Fremantle asked the Secretary of State for India the conditions on which the Persian Gulf section of the Indo-European Telegraph Department of the India Office was being transferred to a commercial company.

Mr. Benn said that the operations of the Indo-European Telegraph Department in Persia and the Persian Gulf were being terminated on March 1st. The question of the arrangements for the working of the cable system in the Persian Gulf after that date was bound up with negotiations which were still proceeding with the Persian Government. Pending the conclusion of these negotiations he was not in a position to make any further statement.

The Penny Post.

On February 24th Mr. Viant, Assistant Postmaster-General, informed Mr. Graham White that the annual loss of revenue that would result from a restoration of the penny post was estimated to be of the order of 6½ millions.

The Co-ordination of Electricity.

On February 25th Mr. West asked the Minister of Transport whether he would introduce legislation for the purpose of co-ordinating electricity generating and distribution undertakings in this country on the lines of public ownership.

Mr. Morrison said that the co-ordination of the generation of electricity throughout the country under the Central Electricity Board was secured by the provisions of the Act of 1926. Of the undertakings engaged in distribution, two-thirds were already publicly owned and wide powers existed under the Electricity (Supply) Acts for co-operation and inter-working between the various authorities. He did not contemplate the introduction of legislation in the immediate future.

Mr. West asked the Minister what he proposed to do in relation to the one-third of the undertakings which were still privately owned.

Mr. Morrison said that the Government was in conference with all the supply undertakings with a view to securing accelerated development, but, as he had already indicated, immediate legislation was not intended.

Legal.

Edison Storage Battery Co. v. Britannia Batteries, Ltd., and Others.

In the Chancery Division last week, Mr. Justice Bennett commenced the hearing of an action by the Edison Storage Battery Co., of New Jersey, U.S.A., against Britannia Batteries, Ltd., Edison Accumulators, Ltd., and Mr. J. F. Monnot, claiming certain relief against the defendants. As against Britannia Batteries, Ltd., and Mr. Monnot they asked for damages for alleged breach of contract; as against Britannia Batteries, Ltd., they asked for an injunction to restrain that company from selling or offering for sale storage batteries not of the manufacture of the plaintiffs as "Edison" batteries and from otherwise passing off, or attempting to pass off, any storage batteries not of the plaintiffs' manufacture as the plaintiffs' batteries; as against Edison Accumulators, Ltd., an injunction restraining them from using the expression "Edison accumulators" as part of their name or, otherwise, in a manner calculated to lead to the belief that they were distributors for, or otherwise connected with, the plaintiff company; as against Edison Accumulators, Ltd., a declaration that they were not entitled to the benefit of an agreement of March 19th, 1925, made between the plaintiffs and the other defendants.

Sir Duncan Kerly, K.C., in opening, said that the plaintiffs were the makers of goods which were known all over the world as the Edison storage batteries. The batteries, invented by Mr. Edison, were introduced on the market in 1911 and were, in the first instance, sold by a subsidiary company, the Edison Phonograph Co. Mr. Monnot, under this company, became the sole vendor of these batteries in England. In 1913 a company called Edison Accumulators, Ltd. (which he would call the "old English company"), was incorporated for the express purpose of taking Mr. Monnot's place in the selling of Edison storage batteries, and not to handle any others. Under that head the plaintiffs claimed damages, and if they succeeded the damages would be very heavy indeed. Mr. Monnot, Counsel said, formed a scheme to hand certain things to the German rivals of the plaintiffs. The Germans who controlled the old company were to be a new company, and Mr. Monnot held 7,500 shares in the new company as trustee for the old company's shareholders.

The agreement here in question was for five years with 90 days' notice as to determination, and had nothing untoward happened it would have gone on till June, 1929. But the breaches alleged by the plaintiffs occurred in May, 1928. Counsel understood that the defence now put forward was that the notice which had been given under the agreement was ineffective, because plaintiffs gave notice "by letter." Defendants said the old English company had assigned the agreement to the new English company. Counsel's contention was that there was no right to assign this agreement with the plaintiffs to the plaintiffs' competitors with a £2 paid up capital. The assignment was made without plaintiffs' knowledge and consent. Certain German patents were sold here as "Deac" batteries, which were somewhat like plaintiffs' cells. But the goods of the plaintiffs were being pushed and were known under the distinctive name of Edison. That was the position down to 1928. In 1925 a German company was formed known as the D.E.A.C. Company. It was friendly with the Edison Company and was granted certain licences to manufacture in Germany batteries with features of the plaintiffs' batteries. There was an agreement of 1914 under which the German company was prohibited from competing in this country before the year 1924. The German company had an associated shareholding company called the A.F.A., and they in turn had a subsidiary company in this country called A.F.A., Ltd., of which a Mr. Lind was the director. The licence to manufacture batteries remained in force down to the war. When the war came Mr. Edison refused to have anything to do with Germany. After the war the German company procured a compulsory licence from the German patent authorities. The German company did not attempt to do anything, so far as plaintiffs knew, until about 1925. Counsel did not suggest that A.F.A., Ltd., was formed to attack the plaintiffs. In 1925 certain iron-alkaline batteries of German manufacture were sold on the market, but they were sold as "Deac," the initials of the German firm. About 1927 the Germans apparently made new attempts to sell their manufactured batteries on the market here on a more extended scale, and, said Counsel, they now knew that some of these were described as "German Edison." The plaintiffs heard all this from Mr. Monnot, and the old English company who were supposed to be looking after plaintiffs' interests here. Plaintiffs then inquired into the matter, but they could get no evidence on which to take proceedings. In 1927, in order

to strengthen their position, plaintiffs thought it advisable to apply for the registration of a trade mark. They, however, had a trade mark consisting of the signature "Thomas A. Edison," in respect of "scientific instruments and apparatus for useful purposes" in Class 8, which covered accumulators. This was cancelled, and the mark was re-registered specifically for storage batteries. In November, 1927, plaintiffs applied to register a further trade mark, being the portrait head of Mr. Edison, with the signature "Thomas A. Edison," and above in large letters the word "Edison." In July, 1928, the plaintiffs applied for the registration of the word "Edison." In February, 1929, the application was advertised to the public, but by that time a quarrel between the parties had broken out, and then both companies, and the German company, D.E.A.C., opposed plaintiffs' application and proceedings were now pending, awaiting the result of this action. In 1928 Mr. Monnot got into touch with the Germans. They were anxious to come here and sell under the name of "Edison," with the result that the Germans, to get control, took over the old English company.

On February 26th Sir Duncan dealt with the voluminous correspondence, comprising many hundreds of letters. He said that the correspondence showed that in May, 1928, Mr. Monnot was arranging to start manufacturing accumulators here and also to start copying the plaintiffs' Edison batteries. The correspondence further showed a scheme for reducing the capital of the old company so that the Germans would obtain control more easily. Counsel sought to establish by the correspondence a breach by the old English company and Monnot of the agreement of March, 1925.

On February 27th Sir Duncan continued reading that part of the correspondence which dealt with what he alleged was a breach of the agreement. Counsel read a letter of June, 1928, from Mr. Monnot to the plaintiffs in which he complained of the quality of the goods which they were supplying from America. Those complaints were absolutely unfounded, and he hoped to give some explanation regarding them. Either Mr. Monnot was preparing the way for a breach or he might have wanted to get rid of the contract as soon as he had used the plaintiffs for his own purposes to enable him to get continuity, or else he was still carrying on with the plaintiffs as he meant to, because otherwise he could not get supplies, and it would be another six months before he could get what he wanted from Redditch. The Germans had enough to do to supply their Continental trade. He had to get supplies in order to keep up the important business of service. Sir Duncan said he was putting forward this case as a deliberate attempt at deception, and as a concealment of what the defendants were doing for the plaintiffs. The defendants tried to carry on the new company as if it was the old company.

On March 2nd Sir Duncan continued his opening and contended that there was a huge volume of correspondence which showed that "Edison" was the manufacturers' mark for a particular accumulator made only in America and not the name of the whole class of nickel-iron alkaline batteries. That was recognised by the defendants and their customers, but the plaintiffs' allegation was that other accumulators were passed off as their productions.

Mr. Gavin Simonds asked if it was part of the case which he had to meet that in April, 1929, Edison Accumulators, Ltd., had not a large stock of American goods to dispose of.

Sir Duncan stated that they were passing themselves off as the people who had plaintiffs' goods to dispose of, when the only people who had such goods were the old Edison Accumulators, Ltd. (now Britannia Batteries, Ltd.).

Mr. Gavin Simonds added: "And anyone to whom the old English company sold its goods."

The first witness, called for the plaintiffs, was Mr. Charles Edison, son of Mr. Thomas A. Edison, and president of the plaintiff company. He said that "Edison" had always been the principal feature when the cells were sold in America. In this country the feature of all the advertisements had been "Edison," so far as he could judge from a bundle of advertising matter which he had in front of him.

Mr. Edison continued his evidence on March 3rd and in the course of examination by Mr. Whitehead, K.C. (plaintiffs' Counsel), said that in May, 1929, Mr. Monnot went to West Orange and inquired why the plaintiffs had not fulfilled orders from the new company to which he had assigned the contract. The plaintiffs expressed the opinion that the contract was not a sound one as they had given notice of cancellation. They also refused to recognise the new company. Cross-examined by Mr. Gavin Simonds, K.C., for the defendants, Mr. Edison agreed that the plaintiffs' case was that the term "Edison" could only be applied to batteries of their manufacture. Mr. Simonds suggested that the term was applicable to any battery employing an alkaline electrolyte.

Evidence was also given by Mr. James Millar, export manager in New York for the plaintiff company, who mentioned that circulars had been sent out by the New Distributors of Edison Storage Batteries, Ltd., stating that they were the only vendors of genuine "Edison" batteries. Mr. D. Mann, a representative of a firm using electric lorries, said that he had received in September, 1929, a letter from Edison Accumulators, Ltd. bearing the words "Exclusive licensees for the British Isles for the Edison storage battery." The case was still proceeding as we went to press.

Aeonic Radio, Ltd.

In the Companies Court on Monday last, Mr. Justice Maugham adjourned until the first petition day next sittings the petition of the Dubilier Condenser Co., Ltd., and Lionel H. Lemon and Co. for the compulsory winding-up of Aeonic Radio, Ltd.

For the petitioners, Mr. Gedge said that under a reconstruction the company, which was in voluntary liquidation, agreed to transfer its assets to a new company called Electrical and Radio Products, Ltd., and though there was no possibility of the petitioners' debts being paid in full they complained that other creditors had been paid in full.

Mr. Evershed, for the liquidator, said that a scheme had been put forward for settling with the creditors, but two of the difficulties were that the new company could not carry on with the old company's assets plus £30,000 new capital and at the same time pay off all the creditors, and that there was a patent action pending against the old company by the Marconi Co.

Mr. Arthur Sims, for the new company, suggested that an opportunity should be given for a new scheme to be put forward and considered.

His Lordship said that an adjournment would give an opportunity to consider the situation.

Correspondence.

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession.

Motor Impregnation.

Having heard opinions both for and against the value of the impregnation of motors, I should be pleased to have some of your readers' views on this matter, more especially as affecting colliery work, where the conditions are invariably bad. I have been given to understand that an article dealing with this particular subject appeared in one of the electrical periodicals some two or three years ago, mainly dealing with colliery motors, *viz.*, the best type of winding, insulation, and impregnating, but I have not been able to trace it. Perhaps it appeared in one of the American journals.

Alfred Harvey.

Motherwell, *February 24th*, 1931.

Cost of Electricity in the Country.

In your last issue a correspondent, Mr. L. L. Robinson, sought to draw comparison between the proposed rates for supply of the County of London Company at Burnham-on-Crouch with his 2-kW private installation there. I understand that Mr. Robinson is borough electrical engineer of Hackney.

Whilst it is realised that a borough electrical engineer may be totally inexperienced regarding the economics of supplies in rural areas, it is really deplorable to find him rushing into print about it. Mr. Robinson asks where are the ½d. units which were promised and scorns the 1½d. units which are offered him at his country residence, where general supply is made available for the first time this year (the Special Order for the area was only obtained late last year). Mr. Robinson will wait longer for his ½d. units so long as he seeks to decry public supply in out-of-the-way areas and to compare such supply with a 2-kW house set.

The only serious aspect of Mr. Robinson's letter is that potential consumers in Essex may be discouraged on the assumption that a borough electrical engineer should know what he is talking about.

John C. Dalton.

County House, London, E.C.2.
February 26th, 1931.

Wages in the Electrical Contracting Industry.

I think it is a great pity that there is not more discussion regarding the recent rise in wages; the only criticism that has been made against this comes from a business man who is apparently not an electrical contractor.

There would certainly seem to be some justification for remarks with regard to the question of a rise in wages at the present time, as you can constantly see reported that the cost

of living is going down, and not up, and therefore there is nothing that could justify a rise in wages.

It is unfortunate that too few letters are written by electrical contractors, and it therefore seems a pity to stop discussion, as this is what the trade really wants, as it must not be forgotten it is the only Socialised (*sic.* Eds.) trade in the country and that I think is a more important point than any question of the rise in wages.

R. Falshaw,
Governing Director, R. Falshaw, Ltd.

Harrogate, *February 27th*, 1931.

Birmingham's Frequency Change.

I have read with interest letters in your columns from "Freedom," "En Avant," and "Economy," dealing with the question of lump sum settlements.

As one who has been interested in this question, and quite satisfied with the result of my experience, it was very carefully pointed out in the early stages of negotiation that as the "Electricity Supply Industry" is paying for the frequency change, the settlement value would be based on "expense properly incurred."

If your correspondents are in a position for this matter to be of personal interest to them, may I suggest the certain possibility of any difference of opinion being adjusted amicably, with satisfaction and justice to both sides, by consulting with the authorities concerned?

"Forward."

March 2nd, 1931.

Technical Pocket Books.

As the author of several pocket books, based upon my own collection of data, I have been much interested in Mr. C. Turnbull's letter in your last issue. Classification should not be merely arbitrary, but something already established. There are over 150 published classifications, but by far the best of them is the "decimal" as devised by Dewey in America and the International Bureau in Europe. If an author works to such a classification it affords a guide to omissions.

I consider that the day of the bound pocket book has passed away and for that reason my later pocket books have been prepared on a system for facilitating the detachment of leaves, so that they can be utilised directly in the owner's own collection. This is facilitated by a decimal classification numbering of the pages. There is also that excellent American loose-leaf "Lefax" pocket-book system, which provides for the interpolation of the user's own data. The latter can best be prepared by means of a "Varityper" typewriter.

R. Borlase Matthews.

Greater Felcourt, *February 28th*, 1931.

In answer to the query of "Curious" regarding the possibility of securing employment through the medium of so-called "Employment Agencies," my advice to him, and to others likely to try such a means of securing work, is to leave them alone.

Some time ago the writer was reduced to the position of "Despair" and "Curious," and as a last resort he wrote to a well-known firm. The following is the procedure: In return for a certain fee (in this case £2 10s.) about 50 typed applications, together with a list of firms, are sent. The unfortunate man signs the application form, supplies the necessary postage, and so the matter ends. It is therefore quite obvious that this is a method employed by certain people to get rich at the expense of unemployed men. It amounts to this—a person will pay approximately £2 16s. 2d. for a mass of typing that could be had for about 10s.

Once Bitten.

February 27th, 1931.

Published Specifications.

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specification will be printed and abridged, and all subsequent proceedings will be taken.

1929.

22,804. "Electric signalling systems." Siemens & Halske Akt. Ges. July 25th, 1928. (316,228.)

23,585. "Electromagnetic relays or shutter indicators." Telefonaktiebolaget L. M. Ericsson. August 4th, 1928. (316,880.)

23,821. "Electric signalling systems." Siemens & Halske Akt. Ges. March 18th, 1929. (Addition to 316,228.) (342,707.)

28,863. "Pre-shaping return conductor tapes of electric cables." Western Electric Co., Ltd. (B. M. A. Trebes). September 23rd, 1929. (342,647.)

29,211. "X-ray installations." S. G. S. Dicker (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). September 26th, 1929. (342,744.)

29,212. "Manufacture of tubes of highly refractory material." S. G. S. Dicker (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). September 26th, 1929. (342,648.)

29,564. "Method of manufacturing apparatus comprising a thermo-electric couple." S. G. S. Dicker (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). September 30th, 1929. (342,649.)

29,586. "Circuit arrangements for the registration of electric impulses." Telefonaktiebolaget L. M. Ericsson. October 4th, 1928. (342,710.)

29,783. "Selective sound-reproducing machines." J. G. Brenner and B. W. Brenner. October 2nd, 1929. (342,746.)

29,877. "Signalling equipment for the distant indication of the position of adjustable devices, in particular of switches." Siemens & Halske Akt. Ges. October 3rd, 1928. (342,711.)

30,022. "Electric signalling or controlling and measuring systems." British Thomson-Houston Co., Ltd. October 4th, 1928. (342,681.)

30,491. "Lighting fixtures." S. G. S. Dicker (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). October 8th, 1929. (342,751.)

32,345. "Electrical heating panels." R. Grierson and Griersons, Ltd. October 30th, 1929. (342,684.)

33,179. "Electric discharge tubes." S. G. S. Dicker (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). October 31st, 1929. (342,715.)

33,523. "Alternating-current electric distribution systems." Westinghouse Electric and Manufacturing Co. November 3rd, 1928. (342,700.)

33,565. "Electric table lamps and the like." F. T. Cash. November 4th, 1929. (342,705.)

33,674. "Telephone systems." J. E. Pollak (Associated Telephone and Telegraph Co.). November 5th, 1929 (342,726.)

33,842. "Arrangement for operating wireless transmitting apparatus." C. Lorenz Akt. Ges. November 17th, 1928. (342,732.)

33,852. "Keyboards for use in telephone or like systems." Standard Telephones and Cables, Ltd. (L. J. J. Schreiber). November 6th, 1929. (342,733.)

33,854. "Exchange systems for interconnecting telegraph apparatus." Standard Telephones and Cables, Ltd., E. M. S. McWhirter, J. G. Flint, and S. Chapman. November 6th, 1929. (342,735.)

33,856. "Switching mechanisms for use in telephone systems." Standard Telephones and Cables, Ltd., C. P. Smith, and G. Newton. November 6th, 1929. (342,736.)

33,978. "Talking picture apparatus." A. W. Harris. November 7th, 1929. (342,766.)

33,997. "Acoustic horns." Electrical Research Products, Inc. November 24th, 1928. (342,768.)

34,259. "Mercury-arc rectifiers." British Thomson-Houston Co., Ltd., and F. P. Whitaker. November 9th, 1929. (342,782.)

34,528. "Method of insulating a high-tension cable at a joint or terminal." Standard Telephones and Cables, Ltd., and T. R. Scott. November 12th, 1929. (342,796.)

34,702. "Telephone transmission or like systems." Automatic Telephone Manufacturing Co., Ltd., and J. Smith. November 13th, 1929. (342,799.)

34,727. "Totalisators." W. O. Heyne, P. J. Packman, and British Electric Parimutuel, Ltd. November 13th, 1929. (342,800.)

36,348. "Heat radiators more particularly adapted for use with transformers." Associated Electrical Industries, Ltd. December 7th, 1928. (342,823.)

36,869. "Electron discharge devices." British Thomson-Houston Co., Ltd. December 15th, 1928. (342,827.)

38,386. "Electromagnetically-operated interrupters." British Thomson-Houston Co., Ltd. December 14th, 1928. (342,836.)

38,797. "Self-starting synchronous motors." English Electric Co., Ltd., H. S. Carnegie, and R. D. Ball. December 18th, 1929. (342,842.)

1930.

172. "Carrier-wave picture and the like telegraph systems." Telefunken Ges. für Drahtlose Telegraphie. January 16th, 1929. (342,857.)

319. "Electrical connectors." H. C. Browne and E. A. Sanders. January 3rd, 1930. (342,858.)

868. "Cathode radiation tubes for very high potentials." Siemens-Schuckertwerke Akt. Ges. January 10th, 1929. (342,865.)

1,594. "Electric fuses." New Switchgear Construction Co., Ltd., and H. Birch. January 16th, 1930. (342,873.)

2,559. "Means for enclosing joints in electric cables." W. T. Henley's Telegraph Works Co., Ltd., and E. Moor. January 24th, 1930. (342,884.)

3,235. "Electric transformers." Ferranti, Ltd., and G. L. Porter. January 30th, 1930. (342,891.)

3,578. "Application of bases or the like to electrical devices such as radio tubes, incandescent electric lamps, or the like." Westinghouse Lamp Co. February 1st, 1929. (342,895.)

3,925. "Combined thermionic valve and photo-electric cell." Lissen, Ltd., and R. P. Richardson. February 5th, 1930. (342,900.)

4,203. "Systems for the automatic control of electric generating plant." British Thomson-Houston Co., Ltd. February 7th, 1929. (342,903.)

5,874. "Manufacture of electric lamps or the like." General Electric Co., Ltd. (Patent-Treuhand Ges. für Elektrische Gluhlampen). February 21st, 1930. (342,918.)

6,397. "Beacon lights for aeroplane routes." F. Von Mallinckrodt. February 26th, 1930. (342,925.)

10,061. "Electrical contact-making plugs or the like." Coventry Automatic Telephones, Ltd., and J. Eriksen. March 20th, 1930. (342,948.)

13,143. "High-frequency circuit arrangements." Marconi's Wireless Telegraph Co., Ltd. May 16th, 1929. (342,976.)

17,651. "Electric hair combs." G. E. Mignot. June 6th, 1930. (342,989.)

18,105. "Telephone systems." Telefonaktiebolaget L. M. Ericsson. June 13th, 1929. (342,990.)

19,592. "Casings for electro-mechanical lamps." C. Bernasconi and R. M. Berthier. July 2nd, 1929. (Addition to 275,975.) (342,993.)

35,911. "Magnetic cores for use in loading coils and the like." Automatic Telephone Manufacturing Co., Ltd., and P. N. Roseby. November 30th, 1929. (Divided application on 36,772/29.) (342,999.)

Trade Mark Applications.

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from February 25th, 1931:—

Favorit Palaba. No. 514,869. Class 8. Electric cells and batteries, induction coils, and accumulators (not for medical purposes), electric lamps for scientific purposes, radio apparatus, telephone condensers, rectifiers, and battery eliminators.—Pala A. Spos Akciova Tovarna Elektrickych Clanku & Baterii Velslanen, Czecho-Slovakia. (British representatives: Haseltine, Lake & Co., 28, Southampton Buildings, Chancery Lane, W.C.2.)

Wethertex, No. 518,619, and Wetherlite, No. 518,741. Class 8. Electric cables.—Callender's Cable & Construction Co., Ltd., Hamilton House, Victoria Embankment, E.C.4.

Savanette. No. 519,640. Class 8. Sound reproducing and recording apparatus, radio-telephonic apparatus, and radio-telephonic apparatus in combination with gramophones, and parts thereof.—Rose, Morris & Co., Ltd., 57 City Road, E.C.1

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

AUGHTON.—Factory, Dyers' Lane, for J. F. Hurst, Middlewood Road; Christopher Brighouse, architect, Long Lane.

AYRSHIRE.—Academy at Ardrossan (£25,743) and extensions, New Cumnock Higher-grade School (£15,000); master of Works, E.C., Ayr.

BATLEY.—Employment exchange for H.M. Office of Works, King Charles Street, London, S.W.

BIRMINGHAM.—Factory, Minworth, for Kersons Manufacturing Co., Ltd., Wainwright Street; S. J. Smith and Co., builders, 99, Corporation Street.

BLACKPOOL.—Printing works, Preston New Road, for J. A. Fielding; Halstead Best, architect, Leeds Buildings, 20, Clifton Street.

BLAYDON.—Houses (160) and swimming baths for the T.C.; Mr. Masthilo, surveyor. Employment exchange, Shibdon Road; Office of Works.

BOOKHAM (Surrey).—Bank; Lloyd's Bank, Ltd.

BRIGHTON.—Houses (220), Tarners and Whitehawk estates (£98,000); borough engineer.

BURY (Lancs.).—Houses (200), Elton; borough engineer.

CAMBORNE.—Houses (50) for the U.D.C.; surveyor.

CAMBRIDGE.—Four schools for the city E.C.; director of education.

CHELMSFORD.—Catholic school; Rev. Canon W. G. Thompson.

CHISLET (Kent).—Hotel, Hersden, for Shepherd, Neame and Co., Ltd., Faversham; G. J. Shipper, architect.

CONSETT.—Omnibus station for the U.D.C.

COVENTRY.—Telephone exchange, Gibbet Hill, with electrical work, for H.M. Office of Works, King Charles Street, London, S.W. Technical college, Butts Ground, for the E.C.

CRAYFORD (Kent).—Houses (53), Heath Road estate, for the U.D.C.; surveyor.

CROYDON.—Senior school, Rockmount site (£13,560); F. R. Hipperson & Son.

DARLINGTON.—School (300 places), Eastbourne site; Rev. Canon J. Rooney, for the Catholic Trustees.

DAVENTRY. — Alterations and extensions, Infirmary (£30,000); Northants. County architect.

EDINBURGH.—Telephone exchange, Corstorphine; H.M. Office of Works (Contracts Branch), Storey's Gate, Westminster, S.W.1.

FLEETWOOD.—Schools for the Rev. Father J. McKenna, of St. Wulstan's Church, Poulton Road; Mercer and Duckworth, architects, Express Chambers, London Street.

FORT WILLIAM (Inverness).—Playhouse, High Street, for Fort William Playhouse Co., Ltd.; secretary. Business premises and showrooms, High Street, for Macdonald Bros.

GUILDFORD.—Church, Westborough estate; rector of St. Nicholas.

HINCKLEY.—Houses (100), Middlefield estate; U.D.C. surveyor.

HULL.—Extensions, Hull Road and Eastfield Road schools, for the E.C.

IRISH FREE STATE (Abbeyleix, Queen's Co.).—Installation of electric lighting at District Hospital for the Board of Health; T. Reilly, secretary, District Hospital.

(Ballinasloe, Co. Galway).—Church, Creagh; W. H. Byrne & Son, architects, 20, Suffolk Street, Dublin.

(Limerick).—Houses (74), Cornmarket and Rosbrien sites, for the Corporation (£25,041); M. Doyle, builder.

KENT.—Children's homes, Eastry (£12,478), and extensions, Medway Institution (£18,000), for the Public Assistance Committee; county architect, Maidstone.

LANCASHIRE.—Senior school, Kearsley (£45,000), for the County E.C.

LANCASTER.—Church, Bulk Road; R. J. Skilling, architect, 66, Market Street. Reservoir (£250,000); James Mansergh & Sons, engineers.

LANCHESTER.—Installation of electric lighting at the small-pox hospital; Mr. Barker, clerk to the Joint Hospital Board.

LEEDS.—Houses (8,000) during the next five years; city architect.

LEICESTER.—Abattoir (£20,000); city architect and trade contractors. Two branch libraries; city engineer.

LEIGH (Lancs.).—Senior boys' school near Etherston Street; director of education.

LIVERPOOL.—Bank, Prescot Road, for Lloyd's Bank, Ltd.; Joshua Henshaw & Sons, builders, 10, Chatham Street.

LONDON (Poplar, E.).—Clearance scheme, Ingleham area; and flats (80), Millwall; borough engineer. Additions, Moore's Foundry, High Street; Hickman, Ltd.

(Whitechapel, E.).—School, Tench Street (£23,330); L.C.C. architect.

(Deptford, S.E.). — Equipment of technical college (£22,000); L.C.C. architect.

(Lewisham, S.E.).—Stores, Tower House, for the Royal Arsenal Co-operative Society; S. W. Ackroyd, architect, Commonwealth Buildings, S.E.18.

(Peckham, S.E.).—Shops for the Royal Arsenal Co-operative Society at Rye Lane; S. W. Ackroyd, architect, Commonwealth Buildings, S.E.18.

(Balham, S.W.).—Extensions, St. James's Hospital (£137,000); Gibson & Gordon, architects.

(Norbury, S.W.).—Extensions, Manor School (£12,228); Perry's (Ealing), Ltd.

(Westminster, S.W.). — Tenements, Grosvenor estate (£83,289); Gee, Walker & Slater, Ltd.

(Kensington, W.).—Rehousing, Adair Road and Southam Street areas; borough engineer.

LUTON.—School (1,200 places) for the borough E.C.; W. Smith, clerk.

MIDDLESEX.—Senior school, Feltham, for the County E.C.; director of education, 40, Eccleston Square, S.W.

NEWBURY.—Houses (76), London Road; borough engineer.

NEWCASTLE.—Schools (1,800 places), Dunstanborough Road and Clifford Road, for the E.C.

NORTH RIDING.—Extension of Sir William Turner's School, Redcar (£10,650); county architect.

NORTHUMBERLAND.—School, East Chevington (250 places), for the County E.C.; W. W. Tasker, 17, Claremount Place, Newcastle.

OTLEY (Yorks.).—Church, Burley-Menston Road, for the Catholic authorities; Clarkson, Empsall & Clarke, architects, Permanent Chambers, Piece Hall Yard, Bradford.

PETERHEAD.—Cinema (1,300 seats); Pert & Sons, builders, Montrose.

REIGATE.—School, South Park housing estate, for the borough E.C.; director of education.

ROYSTON (Herts.).—Re-erection of "Burloes," residence of Sir Cecil Neumann.

SCARBOROUGH.—Houses (50), Northstead estate; H. W. Smith, borough engineer, Town Hall.

SOLIHULL.—Houses (50) for the R.D.C.; surveyor.

SOUTH ELMSALL (Yorks.).—Houses (250) for Upton Colliery Co., Ltd. School, colliery housing estate, for West Riding E.C.; director of education, Wakefield.

SOUTH SHIELDS.—Fire station; Gustavus Bailey, Ltd., contractors.

STOCKPORT.—Shop, showroom and billiard hall, Princes Street and Bridge Street, for Montague Burton, Ltd., Hudson Road Mills, Hunslet; H. Wilson, architect, 81, North Lane, Roundhay, Leeds.

STOCKTON.—Houses (93), Richardson Street, for the T.C.

STOKE D'ABERNON (Surrey).—Re-wiring Parish Church for electric lighting; Rev. A. S. P. Blackburne, rector.

STOKE-ON-TRENT.—Workshops, Bagnall Street; Staffs. Water Board.

SUNDERLAND.—Houses (212), Ford estate, for the T.C.; borough engineer. Enlargement of Commercial Road school for the E.C.

SURREY.—Secondary school, Ham (£44,593), for the County E.C.; W. W. Finny, secretary, Kingston-on-Thames.

THORNABY.—Houses, Acklen Road; Moorhouse & Barker, Ltd. Alterations and improvements, Central Picture Hall, for the T.C.

WATERHOUSES (Durham).—School (£11,363); Walton Bros., Crook.

WATFORD.—Houses (98), Eastbury Road estate, for the T.C.; W. W. Newman, borough engineer.

WEYBRIDGE.—Film studio for Britivox, Ltd., Broad Street, London, E.C.; R. Harold Brine, architect.

WHITLEY BAY.—Houses (400), Broadway site; Temple and Pyle, 329, Whitley Road.

WICK (Caithness).—Houses (50) for the T.C.; surveyor.

WOLVERHAMPTON.—Bank, Snowhill, Barclay's Bank, Ltd.

WOODLEY (Cheshire).—Remodelling premises (£15,000); architect's department, Co-operative Wholesale Society, Ltd., Balloon Street, Manchester.

WREXHAM.—Houses (294) for the R.D.C.; J. H. Edwards, engineer.

YORK.—Houses (134), Burton Lane (£49,580); John Sawdon, Bridlington. Church, Dalton Terrace; Rev. G. Richardson. Hotel, Albemarle Road; J. J. Hunt, Ltd. Extensions, Shipton Street junior and Hill Mount schools; city architect.